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DIFFERENT MODALITIES OF MANAGEMENT OF LIVER ABSCESS

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UNDER SUPERVISION OF

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- Dr Boddupalli Pavani

INTRODUCTION

Liver abscesses constitute a major health concern, particularly in tropical regions where their incidence is notably higher. These abscesses develop because of microbial invasion and proliferation within the hepatic tissue, often originating from infections that spread via the bloodstream, the biliary tract, or direct extension from adjacent structures. The condition can lead to severe complications if not promptly diagnosed and effectively managed, necessitating timely intervention through appropriate antimicrobial therapy and, in many cases, image-guided drainage procedures.

The causative agents can vary, with pyogenic and amoebic infections being the most common.[1] Symptoms of liver abscesses can manifest insidiously, starting with abdominal pain, nausea, vomiting, and fever. Patients may also experience weight loss and hepatomegaly, though local signs are often absent or mild. Less frequently, symptoms like loss of appetite, jaundice, and respiratory issues may occur. However, in some cases, particularly in patients with amoebic abscesses, the onset can be abrupt, characterized by severe abdominal pain, fever, nausea, and leukocytosis.

Complications from liver abscesses can be severe and may arise from the rupture of the abscess into surrounding areas such as the peritoneum, pleural cavity, or pericardium. Ruptured liver abscesses occur in a subset of patients, ranging from 2% to 17%, and are associated with mortality rates between 12% and 50%. This underscores the importance of early diagnosis and intervention to prevent such dire outcomes.

Despite historical challenges, mortality rates associated with liver abscesses have significantly decreased in recent years, currently standing at around 2.5%. This improvement is largely attributed to advances in diagnosis and treatment modalities. The primary mode of treatment for amoebic abscesses is medical therapy. some cases may prove refractory to medical management, especially abscesses larger than 5 cm or those complicated by

secondary bacterial infection. In such instances, percutaneous needle aspiration[2] (PNA) or percutaneous catheter drainage (PCD) are commonly employed. These minimally invasive procedures have become the preferred approach, with open surgical drainage reserved for cases that do not respond to percutaneous interventions.

Effective management of liver abscesses requires a multidisciplinary approach involving prompt diagnosis, appropriate antimicrobial therapy, and, when necessary, drainage procedures. By employing these strategies, healthcare providers can mitigate the morbidity and mortality associated with this condition, particularly in tropical countries where it poses a significant public health burden. A liver abscess is a significant infectious lesion within the liver, commonly encountered due to the liver's exposure to various viral, bacterial, and parasitic agents through the portal circulation.

Among visceral abscesses, liver abscesses are the most prevalent. They are categorized primarily into amoebic liver abscess and pyogenic liver abscess based on their etiology. Amoebic liver abscesses are particularly prevalent in tropical and subtropical regions, earning them the moniker "Tropical liver abscess." These abscesses are caused by infestation with Entamoeba histolytica, with approximately 3-9% of patients with amoebiasis progressing to develop such abscesses.[3] Interestingly, they tend to affect younger individuals compared to pyogenic liver abscesses.

Moreover, there's a male predominance in cases of amoebic liver abscess, whereas pyogenic liver abscesses exhibit an equal sex incidence. The liver plays a crucial role in the body's reticuloendothelial system, housing a significant portion of this immune system. This allows the liver to effectively manage continuous low-level exposure to enteric bacteria, which are primarily received through the portal circulation. Consequently, non-viral infections in the liver are relatively uncommon, owing to the high concentration of reticuloendothelial cells present in this organ. Liver abscesses pose a notable health concern, particularly in tropical

areas, where they are more prevalent. Understanding the etiology and demographics of different types of liver abscesses is crucial for effective management and prevention strategies. Liver abscesses can have various origins, including parasitic, bacterial, fungal, or tuberculous causes.

The right lobe of the liver is particularly susceptible due to its larger volume and significant blood supply. Approximately 90% of liver abscesses in the right lobe are solitary, whereas only about 10% of those in the left lobe are solitary. Additionally, abscesses can develop following a suppurative process originating from elsewhere in the body. Pyogenic liver abscesses, which are caused by bacteria, typically arise from several sources, including the biliary tract, portal circulation, hematogenous spread via the hepatic artery, direct extension from intra-abdominal regions, or trauma. Among these, biliary pathology stands out as the most common cause. In cases of amoebic liver abscess, abdominal pain is the predominant symptom. Conversely, fever is the most frequent symptom observed in pyogenic liver abscesses. Large abscesses are more commonly associated with amoebic liver abscesses. Understanding the varied presentations and etiologies of liver abscesses is essential for accurate diagnosis and appropriate management strategies.[1]

Diagnosing liver abscesses typically relies on ultrasonography as the primary imaging modality. However, CT scans of the abdomen offer even greater sensitivity, capable of detecting abscesses smaller than 0.5 cm in diameter. To confirm the etiology of the abscess, serological tests are crucial for diagnosing amoebic liver abscesses, while pus culture and sensitivity are essential for identifying the pyogenic origin. The management of liver abscesses varies depending on the etiology. For amoebic liver abscesses, medical management is the mainstay of treatment, while for pyogenic liver abscesses, drainage procedures combined with antimicrobial therapy are key.

Various treatment options are available for liver abscesses, including:[4]

1. Drug therapy alone, particularly for amoebic liver abscesses.

2. Ultrasonography-guided needle aspiration combined with drug therapy.

3. Percutaneous catheter drainage, which can effectively drain the abscess while providing access for ongoing treatment.

4. Laparoscopic drainage, a minimally invasive surgical option that allows for precise visualization and drainage of the abscess.

5. Open surgical drainage, reserved for cases where less invasive methods have failed or are not feasible.

Choosing the appropriate treatment method depends on factors such as the size and location of the abscess, the patient's overall health, and the underlying cause. By selecting the most suitable approach, healthcare providers can effectively manage liver abscesses and improve patient outcomes. In this study, a total of 54 cases were randomly selected to investigate various aspects related to liver abscesses. The primary focus was on analyzing the age distribution, sex ratio, types of liver abscesses, site of occurrence, symptoms, signs, size, and number of abscesses in the liver.[5]

For patients with liver abscesses larger than 5 cm, treatment primarily involved needle aspiration, percutaneous drainage, or laparoscopic drainage methods. These patients were evaluated based on several criteria, including:[5]

1. Reduction in abscess cavity size: The extent to which the size of the abscess cavity decreased following the intervention, with a target of achieving a 50% reduction.

2. Duration of hospital stay: The length of time patients required hospitalization for treatment and recovery.

3. Secondary procedures: Any additional interventions or procedures performed after the initial treatment to manage complications or address unresolved issues related to the abscess.

4. Complications: Any adverse events or complications that arose during or after the

treatment, such as infection, bleeding, or organ damage.

5. Recovery rate: The rate at which patients recovered from their liver abscesses, assessed based on resolution of symptoms, improvement in clinical condition, and absence of recurrence.

By comparing these parameters among the treated patients, the study aimed to evaluate the effectiveness of different treatment modalities and their impact on patient outcomes. This comprehensive analysis provides valuable insights into the management of liver abscesses and helps guide clinical decision-making to optimize patient care and recovery.

RATIONALE OF THE STUDY

The rationale for investigating the topic "Different Modalities of Management of Liver Abscess" lies in the significant clinical implications associated with the treatment of this condition. Liver abscesses represent a serious health concern, often requiring prompt and effective management to prevent complications and improve patient outcomes.

Given the diverse etiologies and variable clinical presentations of liver abscesses, there exists a need to explore and compare the efficacy of different treatment modalities. Understanding which interventions, such as needle aspiration, percutaneous drainage, or laparoscopic drainage, yield the best outcomes in terms of abscess cavity reduction, duration of hospital stay, complications, secondary procedures, and overall recovery rates is crucial for optimizing patient care.

By conducting a comprehensive study comparing these modalities, healthcare providers can gain valuable insights into the most effective approaches for managing liver abscesses, ultimately leading to improved treatment strategies and better patient outcomes.

AIM AND OBJECTIVES

The aims and objectives of this study are as follows:

To evaluate effectiveness of various management strategies in the management of liver abscess,

- conservative medical treatment,
- percutaneous drainage,
- laparoscopy drainage,
- open surgical drainage (laparotomy, thoracotomy, incision and drainage)

REVIEW OF LITERATURE

ANATOMY OF THE LIVER: The liver stands out as the largest organ among the abdominal viscera, occupying a significant portion of the right hypochondrium and the epigastric region. Its vital role in metabolic activities is paramount to maintaining homeostasis, facilitating nutrition, and supporting immune mechanisms.

One of its primary functions involves detoxification, eliminating harmful substances from the body while also regulating blood glucose levels and lipid metabolism. Additionally, the liver serves as a reservoir for essential nutrients such as vitamins, iron, and micronutrients. Anatomically, the liver exhibits distinct superior, anterior, right, posterior, and inferior surfaces. Grossly, it is divided into four lobes: the right, left, quadrate, and caudate lobes. More recently, the liver has been functionally divided into eight segments based on Couinaud's classification system, allowing for a more precise understanding of its structural and functional complexity. [6]

The location of a liver abscess plays a crucial role in determining the appropriate therapeutic approach for drainage. In comparison to the left lobe, the right lobe is often easier to drain percutaneously. This is attributed to the preferential drainage of the superior mesenteric vein into the right lobe, resulting in a higher volume of blood flow. Consequently, abscess formation is more common in the right lobe due to the increased likelihood of infectious agents reaching this region.[7] Understanding the unique anatomical and physiological characteristics of the liver aids in guiding therapeutic decisions and optimizing treatment outcomes for patients with liver abscesses.

HEPATIC ARTERY: The liver receives a significant portion of its blood supply from the hepatic artery, which carries oxygenated blood from the systemic circulation.

This artery contributes approximately 25% of the total blood flow to the liver and provides 30% to 50% of its oxygenation.[8,9] The anatomy of the celiac axis and hepatic arterial system

plays a crucial role in supplying blood to the liver. The celiac axis, located just below the diaphragmatic hiatus, branches into three main arteries: the splenic artery, the left gastric artery, and the common hepatic artery.

The common hepatic artery travels in a rightward direction before turning superiorly toward the liver's hilum. At this turning point, the proper hepatic artery originates after giving off the gastroduodenal artery.

The proper hepatic artery then branches into the right and left hepatic arteries within the liver's hilum. Additionally, a middle hepatic artery may arise from the proximal part of the left hepatic artery, supplying segment IV of the liver.

The cystic artery, which supplies blood to the gallbladder, typically branches off from the right hepatic artery within an anatomical area known as the triangle of Calot. Understanding the intricate anatomy of the hepatic arterial system is essential for surgeons and clinicians, as it influences surgical approaches and interventions involving the liver and surrounding structures.

HEPATIC VEINS: The liver has a system of veins that drain blood from its surfaces into the inferior vena cava (IVC), a large vein that carries blood back to the heart. There are three main hepatic veins responsible for this drainage.

The right hepatic vein travels through a space called the right scissura and drains most of the right side of the liver. It then makes a short journey outside the liver before joining the right side of the IVC. The middle and left hepatic veins come together inside the liver and join as one before entering the left side of the IVC.

However, sometimes they may drain separately. The left hepatic vein runs through the left scissura and drains blood from segments II and III of the liver. Meanwhile, the middle hepatic vein runs between segment IV and the front part of the right liver, draining blood from segment IV and part of the front part of the right liver. [10]

Apart from these major veins, there's also the umbilical vein, which runs beneath a ligament called the falciform ligament, between the left and middle veins. Usually, it empties into the left hepatic vein. There are many smaller veins that drain blood from the back part of the right liver and the caudate lobe directly into the IVC at the back. Sometimes, there's a small vein from the caudate lobe that drains upwards into the left hepatic vein. Understanding how blood drains from the liver is important for doctors when treating liver conditions.

PORTAL VEIN: Approximately 75% of hepatic blood flow is supplied by the portal venous system. Although this system is postcapillary and largely deoxygenated, its high-volume flow provides 50% to 70% of the liver's oxygenation.

The portal venous system lacks valves, allowing it to accommodate high flow at low pressure due to its low resistance. This feature enables portal venous pressure to be measured at any point along the system.

The portal vein forms posterior to the pancreas neck at the confluence of the splenic and superior mesenteric veins, at the level of the L2 vertebra. It typically measures 5.5 to 8 cm in length and approximately 1 cm in diameter.

Superior to its formation, the portal vein courses behind the first portion of the duodenum and enters the hepatoduodenal ligament, where it runs along the right border of the lesser omentum, usually posterior to the bile duct and hepatic artery. At the liver hilum, it divides into right and left main branches.

The left portal vein runs transversely along the base of segment IV and into the umbilical fissure, supplying segments II and III and providing feedback branches to segment IV. It also gives off posterior branches to the left caudate lobe.

The right portal vein has a short extrahepatic course before entering the liver, where it divides into anterior and posterior sectoral branches. These branches may occasionally be visible extrahepatically or arise from the main portal vein before bifurcation. A small posterior

branch often arises from the right portal vein or its bifurcation to supply the caudate process.[11]

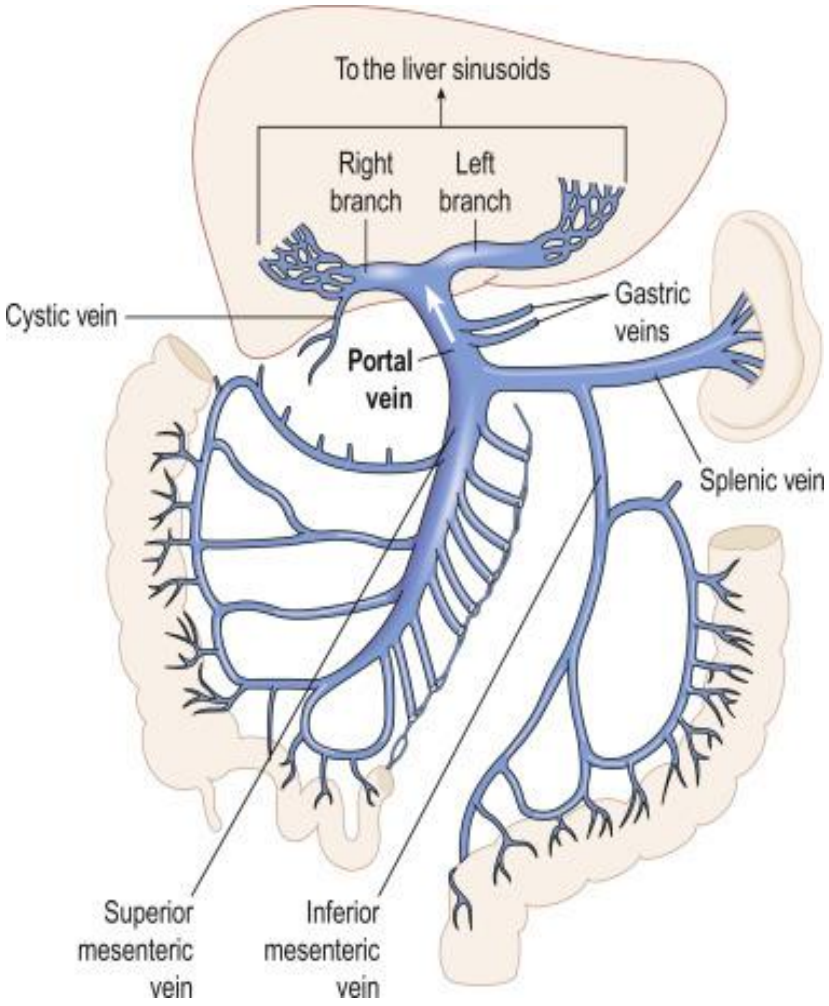


Fig.1: The hepatic portal venous system.

BILIARY SYSTEM: The intrahepatic bile ducts are tiny tubes within the liver that carry bile, a digestive fluid, to the bile ducts outside the liver. They branch out from the main right and left hepatic ducts, which are larger ducts that collect bile from different parts of the liver. These intrahepatic bile ducts extend into the liver tissue, invaginating Glisson's capsule at the hilum, which is the central area where blood vessels and ducts enter and exit the liver. At the hilum, these bile duct branches join with branches of the portal vein and hepatic artery, forming structures known as peritoneal-covered portal triads.

Along these intrahepatic portal pedicles (bundles of blood vessels and ducts), the bile duct

branches are typically located above the portal vein branches, while the hepatic artery branches run below them. This arrangement helps ensure efficient transport of bile and blood within the liver and plays a crucial role in liver function and digestion. Understanding the anatomy of these structures is essential for diagnosing and treating liver diseases and disorders.[12]

Left & Right Hepatic Duct:

The left hepatic duct carries bile from segments 2, 3, and 4 of the liver's left side. Inside the liver, small ducts from these segments come together to form the main left hepatic duct. This duct runs across the base of segment 4 before joining the right hepatic duct at the hilum, which is the liver's central area. Along its path, the left hepatic duct drains several smaller branches from segment 4. the right hepatic duct collects bile from the liver's right side.

It's created by the merging of two smaller ducts: the anterior sectoral duct, which drains segments 5 and 8, and the posterior sectoral duct, which drains segments 6 and 7. These ducts have different directions: the posterior sectoral duct runs horizontally and backward, while the anterior sectoral duct runs vertically. The main right hepatic duct then splits into two just above the right portal vein. The shorter branch meets the longer left hepatic duct, forming the common hepatic duct in front of the right portal vein.

The caudate lobe, also known as segment I, has its own bile drainage system. Usually, it drains through both the right and left systems. However, in about 15% of cases, drainage is only through the left system, and in 5%, it's only through the right system. Understanding the anatomy of these ducts is important for diagnosing and treating liver problems effectively.[13]

COMMON BILE DUCT: The common hepatic duct descends downward and, once it passes below the cystic duct, it is termed the common bile duct. This common bile duct runs alongside the right side of the hepatoduodenal ligament, positioned to the right of the hepatic artery and in front of the portal vein.

Continuing its course downward, typically around 10-15 centimeters long and 6 millimeters in diameter, the common bile duct travels behind the first part of the duodenum and into the head of the pancreas, angling downward and slightly to the right. Inside the pancreas, the distal part of the common bile duct connects with the main pancreatic duct, known as the duct of Wirsung. This connection may or may not involve a common channel. Together, they enter the second part of the duodenum through a structure called the major duodenal papilla of Vater.

At the point where the common bile duct meets the duodenum, there's a complex muscular structure called the sphincter of Oddi. This muscular complex has three main parts: the choledochal sphincter, a circular muscle that regulates bile flow and controls the filling of the gallbladder; the pancreatic sphincter, which may vary in size and surrounds the pancreatic duct within the duodenum; and the ampulla sphincter, composed of longitudinal muscle fibers, which prevents contents from the duodenum from flowing backward into the bile ducts. This sphincter plays a crucial role in regulating bile flow and preventing reflux of duodenal contents into the biliary tree.[13]

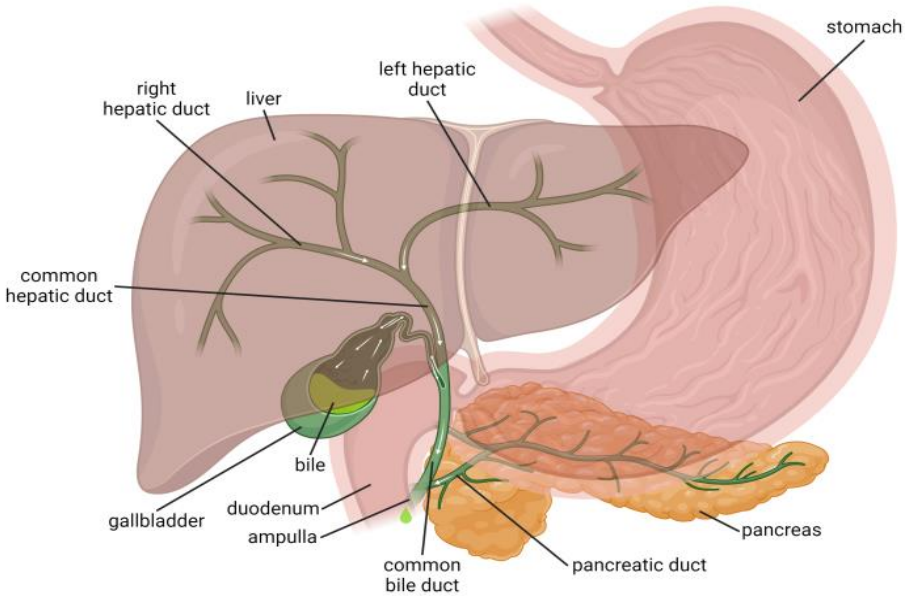


Fig.2: Bile Storage & Release

INFECTIOUS DISEASES

Pathogens can reach the liver through contiguous spread from neighboring infections, direct injury from blunt or penetrating abdominal trauma, or hematogenous dissemination. Hematogenous spread typically results from systemic bacteremia or intra-abdominal infections. However, bacteremia is detectable in only 43% of hepatic abscess cases, complicating diagnosis in these instances.[14,15]

In intra-abdominal infections such as appendicitis and diverticulitis, bacteria can invade the portal vessels, leading to pylephlebitis and portal pyemia, which may ultimately result in hepatic abscess formation.[16]

Diverticulitis, being more likely to cause mucosal defects or perforation than diverticulosis, makes the inclusion of diverticulosis patients noteworthy. This suggests that the incidence of hepatic abscesses in this group may have been even higher if the study had focused solely on diverticulitis cases. Advances in diagnostic methods and early surgical intervention have significantly reduced the occurrence of hepatic abscesses from appendicitis and diverticulitis.

Nonmetastatic colorectal cancer has also been linked to hepatic abscess formation, likely due to tumor-induced mucosal disruption, which facilitates bacterial invasion and entry into the bloodstream.[17]

Currently, the most common route of infection is the biliary tree, responsible for 30%–50% of cases of Hepatic abscess.[18]

Biliary infections primarily occur in the presence of obstruction due to gallstone disease, malignancy, or stricture, leading to bacterial proliferation in the biliary tract, ascending cholangitis, and subsequent invasion of the liver parenchyma.

AMOEBIC LIVER ABSCESS

HISTORY: Throughout history, evidence of gastrointestinal disorders, including diarrhoea, has been documented, with ancient Sanskrit texts dating back to 3000 B.C. mentioning

symptoms like blood and mucous in diarrhoea. Moreover, historical records describe the presence of ball-like abdominal masses associated with hepatic abscesses.

Notable advancements in understanding tropical abscesses emerged from autopsy series, with descriptions of twenty-six cases linked to dysentery. This period also witnessed significant progress in identifying the etiology of diarrhoeal diseases, notably with Leish's recognition of amoebae in colonic lesions among dysentery patients.

From the late 19th to the early 20th century, there was a notable expansion in identifying various amoeba species in human hosts, including Entamoeba gingivalis, Entameba coli, Iodamoeba butschlii, and Entamoeba hartmanni. In a landmark development in 1903, Schaudin formally classified Entamoeba histolytica, establishing it as a significant pathogen in amoebic dysentery. This era saw the identification of Entamoeba dispar, morphologically akin to E. histolytica but recognized as a distinct species.

Notably, E. dispar is primarily associated with asymptomatic carrier states, shedding light on the spectrum of amoebic infections and their varied clinical presentations. These historical milestones underscore the evolving comprehension of gastrointestinal infections and their causal agents, laying the groundwork for subsequent research endeavors and therapeutic innovations.

HOST RESPONSE: Trophozoites, the active form of the amoeba Entamoeba histolytica, are rich in cellular components, including ribosomal, lysosomal, and cytoplasmic materials. These trophozoites possess surface antigens that stimulate an antibody response, leading to the production of specific antibodies in infected individuals.

These antibodies can be detected in various bodily fluids, including feces, serum, and materials obtained from liver abscesses, providing diagnostic clues for identifying amoebic infections. The immune response to amoebic infection is multifaceted, involving the production of immunoglobulins, particularly immunoglobulin G (IgG), which plays a central

role in the humoral immune response. Immunoglobulin M (IgM) is generated as part of the immune reaction to the infection. Interestingly, immunoglobulin E (IgE) is typically not produced in response to amoebic infection, distinguishing it from certain other parasitic infections.[19]

One intriguing aspect of the immune response to amoebic infection is the lytic effect observed with immune serum and immune globulin derived from individuals who have previously experienced an amoebic infection. This suggests that the antibodies present in immune serum or immune globulin possess the ability to target and destroy the amoebae, contributing to the host's defense against the infection.

Understanding the intricate interactions between the host immune system and Entamoeba histolytica is crucial for developing effective diagnostic methods and treatment strategies for amoebic infections. By elucidating the mechanisms underlying the immune response to this parasitic pathogen, researchers can potentially identify novel therapeutic targets and improve patient outcomes. In human beings, the immune response against amoebiasis involves both humoral and cell-mediated immunity, with distinct roles in combating the infection.

Humoral immunity is primarily active against non-invasive forms of amoebiasis before the disease becomes invasive. On the other hand, cell-mediated immunity plays a crucial role in defending against invasive amoebiasis, particularly in controlling the spread of the parasite within the body. Following amoebic infection, antigens from the parasite sensitize T-lymphocytes, triggering their activation and proliferation.

These activated T-lymphocytes then produce lymphokines, which are signaling molecules that regulate the immune response, and activate macrophages. Macrophages, in turn, play a pivotal role in engulfing and destroying the amoebae, thereby limiting the progression of the infection. Several factors can predispose individuals to the development of invasive amoebiasis.

Malnutrition and alcohol intake have been identified as significant risk factors, potentially impairing immune function and increasing susceptibility to invasive disease. Furthermore, invasive amoebiasis tends to be more prevalent in the male population, although the reasons for this gender predilection are not entirely understood and may involve both biological and behavioral factors.[20]

Understanding the interplay between the immune system and amoebic infection, as well as the influence of various risk factors, is essential for developing effective prevention and treatment strategies.

By elucidating the mechanisms underlying immune responses to amoebiasis and identifying factors that contribute to disease susceptibility, researchers can work towards improving outcomes for individuals affected by this parasitic infection.

HOST FACTORS: Human beings serve as the primary reservoir host for Entamoeba histolytica, the pathogen responsible for amoebiasis. Transmission typically occurs through interpersonal contact, often facilitated by flies and fecal contamination of water sources. Interestingly, while the pathogen Entamoeba dispar is prevalent among individuals who identify as homosexual, it is more commonly found in the female population overall. Notably, menstruating individuals appear to have a lower susceptibility to infection, although the exact reasons for this phenomenon remain unclear.[21]

Breastfed infants benefit from a reduced risk of infection, attributed in part to the low iron content and the presence of protective IgA antibodies in breast milk. Conversely, the consumption of country liquor, which tends to contain higher levels of iron, has been linked to an increased risk of invasive amoebiasis. Individuals of poor socioeconomic status and young adults are more commonly affected by amoebiasis compared to older individuals.

The protective effect against liver abscesses observed during menstruation is lost during

pregnancy. This suggests that hormonal changes during pregnancy may alter immune responses, potentially increasing susceptibility to certain infections such as amoebiasis. Understanding the various factors influencing susceptibility to amoebiasis is crucial for developing targeted prevention strategies and improving overall public health outcomes.[22]

INCIDENCE: Amoebiasis is a global health concern, but its incidence is notably highest in tropical and subtropical regions. Interestingly, some individuals who test positive for amoebiasis serologically and exhibit positive stool cultures may not display clinical symptoms.

This asymptomatic presentation is now understood to be associated with Entamoeba dispar, a non-pathogenic species of amoeba. Approximately 3 to 9 percent of patients with intestinal amoebiasis are at risk of developing amoebic liver abscesses, a severe complication of the disease. The development of these abscesses can be influenced by various factors. Heavy alcohol consumption in males, hormonal fluctuations in women before menstruation, and iron deficiency anemia have been identified as factors that may protect against the development of liver abscesses in menstruating women.

Understanding the factors that influence the development and progression of amoebiasis, including the risk of complications such as liver abscesses, is crucial for guiding clinical management and public health interventions. By identifying populations at higher risk and implementing targeted preventive measures, healthcare providers can work towards reducing the burden of amoebiasis and its associated complications.[23]

EPIDEMIOLOGY: Amoebic infection is intricately linked with environmental and socioeconomic factors, particularly in developing countries. Poor sanitation, hot climates, inadequate hygiene practices, and overcrowded living conditions, prevalent among lower socioeconomic groups, create fertile ground for the transmission and spread of the disease.

This is often exacerbated by factors such as lack of access to clean water and proper waste disposal systems. Males in the age group of 30 to 50 years are commonly affected by amoebic infection, with several factors contributing to this demographic trend.

Heavy alcohol consumption can lead to hepatocellular damage, creating a nidus for the seeding of infection from the intestine through the portal venous system. hormonal effects may also play a role in the development of liver abscesses. The primary mode of transmission for amoebic infection is through the fecal-oral route, typically following contamination of food or water sources.

Flies, known vectors for disease transmission, can contaminate food by landing on feces and subsequently spreading the infection through handling or consumption of contaminated food. Moreover, the use of human feces as fertilizer can lead to contamination of water sources and raw sewage, further facilitating the spread of the disease. Unhygienic practices in food handling and preparation within households can also contribute to transmission. An unusual mode of transmission that has been reported is in the paramedical practice of colonic irrigation.

While uncommon, improper sterilization or hygiene practices during these procedures can potentially lead to the transmission of amoebic infection addressing the underlying socioeconomic and environmental determinants, promoting hygiene education, improving sanitation infrastructure, and implementing effective vector control measures are essential for preventing and controlling the spread of amoebic infection in endemic regions. Amoebic liver abscess, although more commonly associated with endemic regions in developing countries, can also occur in travelers from developed countries who have spent extended periods, typically more than one month, in these endemic areas.

During their stay, exposure to Entamoeba histolytica, the causative agent of amoebiasis, increases the risk of developing liver abscesses upon returning to their home countries.

Furthermore, individuals with compromised immune systems, such as those with HIV infection, are at heightened risk for developing amoebic liver abscesses due to their impaired ability to mount an effective immune response against the parasite.

Diseases or conditions that diminish cell-mediated immunity also elevate the likelihood of experiencing amoebic liver abscesses. This is because cell-mediated immunity plays a critical role in combating invasive forms of amoebiasis, including the development of liver abscesses.

Therefore, individuals with conditions that compromise their cell-mediated immune function are more susceptible to severe manifestations of amoebic infection in temperate climates, [19] where amoebiasis is less prevalent, the presentation of amoebic liver abscesses among individuals who identify as homosexual is rare. This is attributed to the fact that in such regions, the predominant species of amoeba involved in homosexual amoebiasis is Entamoeba dispar, which is typically less invasive compared to Entamoeba histolytica.

Therefore, the occurrence of invasive amoebiasis, including liver abscesses, is uncommon in temperate climates among individuals with this particular risk factor. Understanding the various risk factors and scenarios associated with amoebic liver abscesses is crucial for clinicians to consider when assessing and managing patients with suspected or confirmed amoebiasis, especially in regions where the disease is less endemic.

Early recognition and appropriate treatment are essential for improving outcomes and preventing complications associated with this potentially serious condition.[24]

RISK FACTORS

- Alcoholism
- Malnutrition
- Immunocompromised states
- Old age

- Malignancy
- Pregnancy
- Recent travel to tropical regions
- Corticosteroid use leads to reduced immunity
- Acquired immune deficiency syndrome
- Homosexual activity

ENTAMOEBA HISTOLYTICA: Entamoeba histolytica is an anaerobic protozoan parasite that infects humans and primates, causing a range of manifestations collectively known as amoebiasis. The severity of intestinal amoebiasis can vary widely, from asymptomatic infection to symptoms such as discomfort, diarrhea, dysentery, liver abscess, and even amoebic encephalitis.

Several factors influence the clinical presentation of amoebiasis, including the patient's immunity, nutritional status, the amount of infective dose, and the potency of the infective agent. In some cases, the infection remains confined to the intestinal lumen and does not invade tissues. This non-invasive form of the parasite can be identified by the presence of a nucleus and vesicles in the granular cytoplasm. Despite being anaerobic, trophozoites of Entamoeba histolytica can survive in environments with low oxygen tension.

Under certain conditions, trophozoites encyst, forming protective chitinous walls around themselves. These cysts, which become quadrinucleate after cell division, represent the infective stage of the parasite and can remain viable in feces for several days. It's worth noting that trophozoites are susceptible to destruction by stomach gastric juice and cannot survive for extended periods outside the human host.

The factors that stimulate trophozoites to transition from a non-invasive to an invasive state are not fully understood. However, invasive trophozoites typically exhibit larger size and

diameter compared to their non-invasive counterparts.

Understanding the lifecycle and characteristics of Entamoeba histolytica is essential for effective diagnosis, treatment, and prevention of amoebiasis. Further research into the mechanisms underlying pathogenesis and virulence factors of this parasite is necessary to develop improved strategies for combating this widespread and potentially serious infectious disease. The diagnosis of invasive intestinal amoebiasis relies on specific investigations to detect the presence of the parasite in clinical specimens.

The hallmark investigations include demonstrating the parasite in stool samples, rectal mucosal scrapings, or specimens containing trophozoites with ingested red blood cells. However, it's important to note that the presence of cysts and trophozoites in the stool alone is not sufficient to confirm invasive disease, as these forms can also be found in non-invasive or asymptomatic infections. The pathogenicity of Entamoeba histolytica may be heightened when bacterial infections are also present.

This association underscores the complexity of amoebiasis and its interactions with other pathogens in the gut. To better understand the wide variation in disease severity and pathogenicity, recent advances have focused on identifying associations between specific zymodemes of Entamoeba histolytica and the severity of infection. Zymodemes are variations in enzyme patterns within the parasite's genome that may correlate with its virulence.

An immunofluorescent technique has been developed to differentiate between non-pathogenic and pathogenic forms of the parasite, offering a promising tool for diagnosis and risk stratification. It's worth noting that conventional light or electron microscopy techniques alone may not reliably distinguish between non-pathogenic and pathogenic forms of Entamoeba histolytica. Therefore, the development and utilization of more advanced diagnostic methods, such as immunofluorescent techniques, represent significant advancements in our ability to accurately diagnose and manage invasive intestinal

amoebiasis.[25]

MORPHOLOGY

TROPHOZOITE: Entamoeba histolytica, the causative agent of amoebiasis, exhibits distinct morphological characteristics that aid in its identification and understanding of its pathogenicity. Typically, it has a diameter ranging from 15 to 30 micrometers, although the invasive forms can be larger, with a diameter of around 50 micrometers.

This uninucleate protozoan is a facultative anaerobe, meaning it can thrive in both oxygen-rich and oxygen-poor environments. The trophozoite form of Entamoeba histolytica is characterized by a limiting membrane that contains a double layer surrounded by a fuzzy external glycocalyx, measuring approximately 20 to 30 micrometers in diameter. Studies have isolated various strains of Entamoeba histolytica from patients worldwide, with some strains demonstrating pathogenicity, particularly those isolated from patients with mucosal ulceration and hepatic abscesses.

Mobility in Entamoeba histolytica is facilitated by pseudopodia, which are temporary projections of the cell membrane that allow for movement and ingestion of food particles. While trophozoites have the ability to multiply, they are not infective.

In contrast, cysts, another form of the parasite, do not multiply but are responsible for transmission and dissemination of the infection. The trophozoite stage of Entamoeba histolytica is responsible for various clinical manifestations of amoebiasis, including amoebic dysentery, hepatitis, and even encephalitis.

Trophozoites contain fine granular endoplasm, often with ingested red blood cells, and typically possess a single nucleus, distinguishing them from other amoebic species. Understanding the morphology and life cycle of Entamoeba histolytica is crucial for accurate diagnosis and effective management of amoebiasis.

By recognizing the distinct features of this protozoan parasite, healthcare professionals can

better identify and treat infections, ultimately improving patient outcomes.[26]

CYST & LIFE CYCLE

The cyst stage of Entamoeba histolytica is an important part of its life cycle and how it spreads. These cysts are like little capsules, usually around 8-10 micrometers in size, with multiple nuclei inside.

When someone swallows these cysts, they go through a process called excystation in the small intestine, where they burst open and release trophozoites, another form of the parasite.

Cysts are pretty tough and can survive in different environments. They can hang around under fingernails in fecal matter for almost an hour and can live in soil for up to a month, especially if it's not too warm.

However, they don't like getting dried out or exposed to high heat. They also can't handle a lot of iodine or chlorination, which are methods used to purify water.

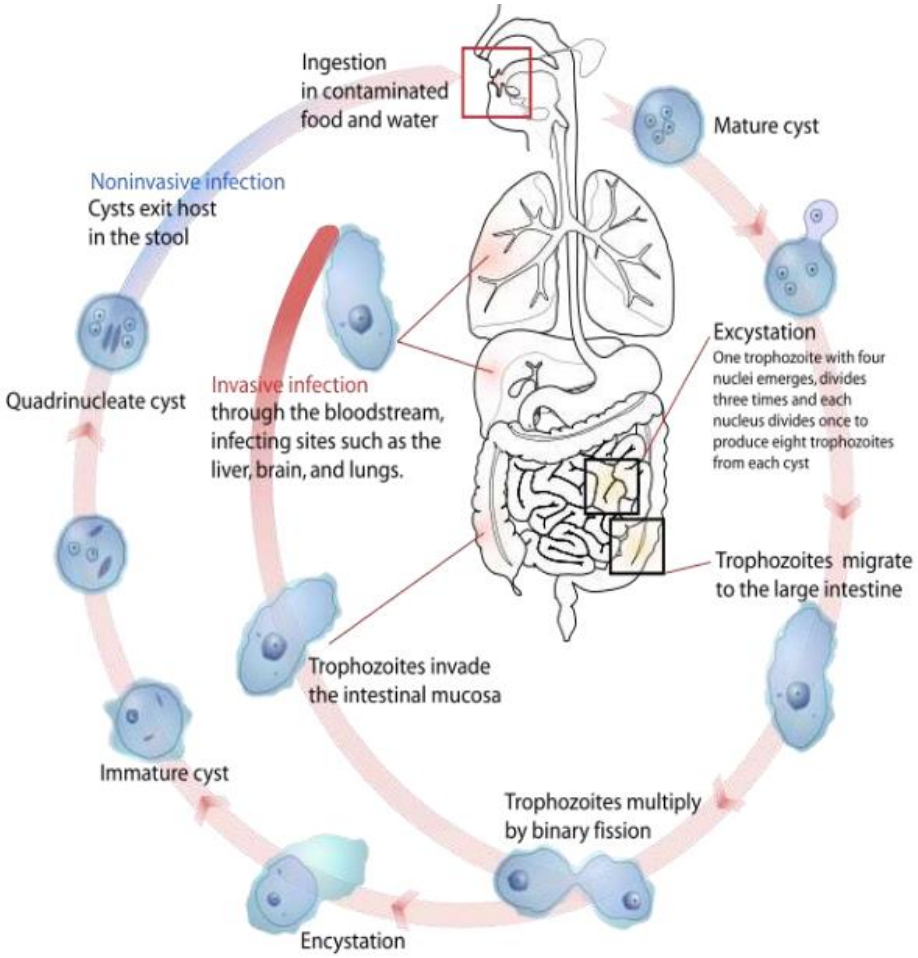


FIG.3. life cycle of Entamoeba histolytica

The life cycle of Entamoeba histolytica starts when someone swallows these cysts, usually through contaminated food or water. Once inside the body, the cysts make their way through the stomach and into the small intestine.

There, they open up, releasing trophozoites that stick to the lining of the gut. These trophozoites multiply for a while before eventually turning back into cysts and leaving the body through feces. When it comes to causing disease, it all starts with someone swallowing these cysts, usually by eating or drinking something contaminated with feces.

Even though the stomach is acidic, the cysts can survive and hatch open in the small intestine, where they release trophozoites. These trophozoites have some powerful tools that help them cause trouble, like proteins on their surface and enzymes that break down tissues.

Understanding how these cysts work and spread is important for figuring out how to stop them from causing disease.

By knowing how they survive and move around, we can come up with better ways to keep people safe from amoebiasis.

The surface lectin of Entamoeba histolytica, which binds to sugars like galactose and N-acetyl galactosamine (GalNAc), plays a crucial role in the parasite's ability to stick to the walls of the colon. Once attached, the parasite forms a persistent infection by binding to glycoproteins in the intestine.

This binding triggers a cascade of events, including the activation of caspases, particularly caspase 3, which is involved in programmed cell death or apoptosis. This activation leads to cell killing and the formation of abscesses. Amoeba pores, small peptides released by the trophozoites, are another key player in the parasite's pathogenicity.

These peptides break down the lipid bilayer of the mucosal epithelium, disrupting the barrier function of the mucosa and providing a portal of entry for the organism. The pathogenicity of amoeba pores lies in their ability to cause colloid osmotic lysis of the cell, essentially bursting it open.

Cysteine proteases produced by Entamoeba histolytica contribute to the pathogenesis of the infection. These proteases are involved in degrading extracellular proteins and disrupting the integrity of the cell monolayer.

As the infection progresses, the parasite invades deeper layers of tissue, spreading laterally and forming characteristic flask-shaped ulcers. At this stage, the differential diagnosis may include inflammatory bowel disease.

It's important to note that the severity of the infection and the risk of complications, such as perforation and abscess formation, are increased in individuals who use corticosteroids. These medications can suppress the immune system, making individuals more susceptible to

severe manifestations of Entamoeba histolytica infection.

Understanding the mechanisms by which the parasite causes disease helps guide treatment strategies and underscores the importance of early diagnosis and appropriate management, especially in individuals at higher risk.[26]

PATHOPHYSIOLOGY: The most common site for a hepatic abscess is in the right lobe of the liver, accounting for about 75% of cases. This preference is due to the way blood flows more smoothly to the right side of the liver.

The left lobe is affected about 20% of the time, while involvement of the caudate lobe is less common, occurring in only about 5% of cases. Roughly half of hepatic abscesses are solitary, meaning they exist as a single cavity, although they can vary in size from less than 1 millimeter to several centimeters in diameter.

Sometimes they can have multiple compartments or be linked to adjacent structures due to surrounding inflammation. In earlier reports, so-called sterile abscesses were frequently mentioned, but this was likely due to insufficient culturing techniques. In modern studies, fewer abscesses are sampled before antibiotics are administered.

Abscesses originating from pyelophlebitis or cholangitis tend to be polymicrobial, meaning they involve multiple types of bacteria, often with a high proportion of gram-negative rods. Systemic infections usually involve just one type of organism.

The majority of hepatic abscesses are polymicrobial, with about 40% being caused by a combination of different bacteria. Anaerobic bacteria are involved in around 40% to 60% of cases. Among the microorganisms commonly found in cultures are Escherichia coli and Klebsiella pneumoniae.

Gas-forming abscesses are often linked to Klebsiella. Other bacteria like Staphylococcus aureus, Enterococcus species, Streptococcus viridians, and various Bacteroides species are also frequently encountered.

Less common organisms, found in fewer than 10% of cultures, include Pseudomonas, Enterobacter, Proteus, Citrobacter, Serratia, beta-hemolytic streptococci, microaerophilic streptococci, Fusobacterium, Clostridium, and other rare anaerobes. Blood cultures are positive in approximately 50% to 60% of cases. Fungal and mycobacterial hepatic abscesses are rare and usually occur in individuals with compromised immune systems, such as those undergoing chemotherapy.[27]

CLINICAL PRESENTATION: Patients with hepatic abscesses can present with a variety of symptoms depending on the severity and location of the infection:

- **Systemic Symptoms:** These include fever, chills, and rigors, which are common signs of infection. Other systemic symptoms may include loss of appetite, unintentional weight loss, and jaundice, indicating liver dysfunction.
- **Abdominal Symptoms:** Abdominal pain and tenderness are hallmark signs of a hepatic abscess. Patients may experience localized guarding and rigidity in the right upper abdomen, where the liver is located. A palpable mass may also be present, indicating the presence of the abscess. Additional signs may include the accumulation of fluid in the abdomen (ascites), enlargement of the spleen (splenomegaly), and swelling of the abdominal wall (abdominal wall edema).
- **Thoracic Symptoms:** Some patients may develop thoracic symptoms, such as a dry cough, chest pain in the right lower part of the chest, and right shoulder pain. These symptoms may occur due to irritation of the diaphragm or involvement of the adjacent structures. Pleural effusion, the accumulation of fluid around the lungs, may also occur, leading to difficulty breathing and intercostal tenderness.
- **Complications:** Complications of hepatic abscesses can include rupture, which can lead to peritonitis (infection of the abdominal cavity), or the spread of infection to the

bloodstream (septicemia). Liver failure may also occur in severe cases, leading to further complications.[28]

DIAGNOSIS:

Diagnosing a hepatic abscess involves a comprehensive approach that includes physical examination, laboratory tests, and imaging studies.[29]

1. Physical Examination:

During the physical examination, the healthcare provider may observe signs such as tenderness in the right upper quadrant of the abdomen, hepatomegaly (enlarged liver), and jaundice (yellowing of the skin and eyes).

They may also palpate for a mass in the right upper quadrant and check for signs of ascites (abnormal fluid buildup in the abdomen) or pleural effusion (fluid accumulation around the lungs).

2. Laboratory Investigations:

Laboratory tests play a crucial role in diagnosing hepatic abscess. A complete blood count may reveal an increased white blood cell count, indicating inflammation or infection. Anemia is common and may also be detected. Liver function tests, including measurements of bilirubin, albumin, and liver enzymes (such as ALT and AST), can provide information about liver function and any abnormalities associated with the abscess.

Prothrombin time, a measure of blood clotting function, may be prolonged, necessitating further evaluation and management. Additionally, specialized tests like the indirect hemagglutination test may be conducted to detect specific antibodies associated with the infection.

3. Imaging Studies:

Imaging studies are essential for confirming the presence of a hepatic abscess and assessing

its characteristics. Chest X-rays may reveal abnormalities such as pleural effusion or an elevated diaphragm.

Abdominal X-rays are less commonly used but can sometimes show signs of air-fluid levels or gas within the liver. Ultrasonography is often the initial imaging modality of choice. It can visualize the liver and detect abnormalities such as hypoechoic lesions consistent with abscesses. However, ultrasonography may have limitations in visualizing certain areas of the liver and is operator-dependent.

Computed tomography (CT) scans provide detailed images of the liver and surrounding structures. CT scans can accurately identify abscesses, differentiate between solid and cystic lesions, and assess the extent of involvement. Contrast-enhanced CT scans enhance the visualization of abscesses and their surrounding tissues, aiding in diagnosis and treatment planning.

A combination of physical examination findings, laboratory tests, and imaging studies is crucial for diagnosing hepatic abscesses accurately and guiding appropriate management.

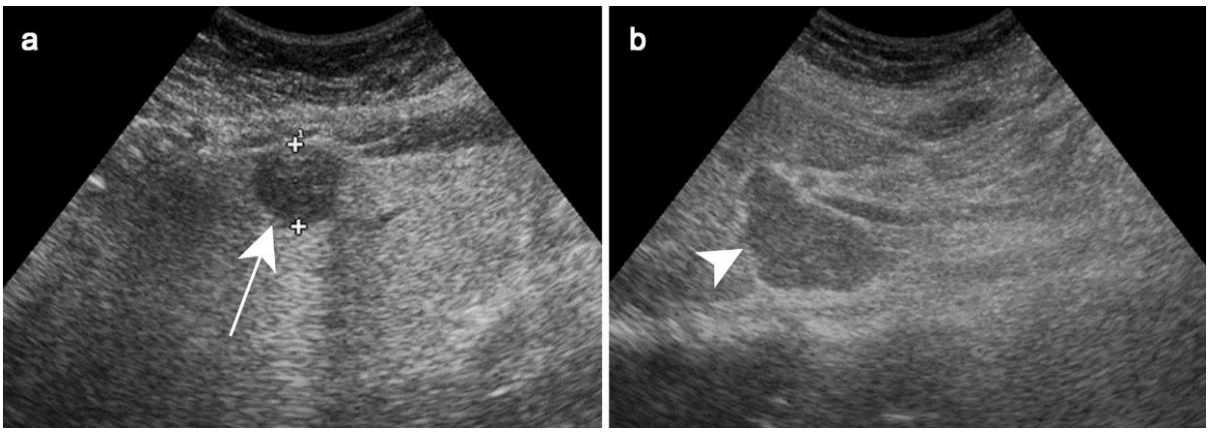


Fig.4: Typical imaging finding of Liver Abscess[30]

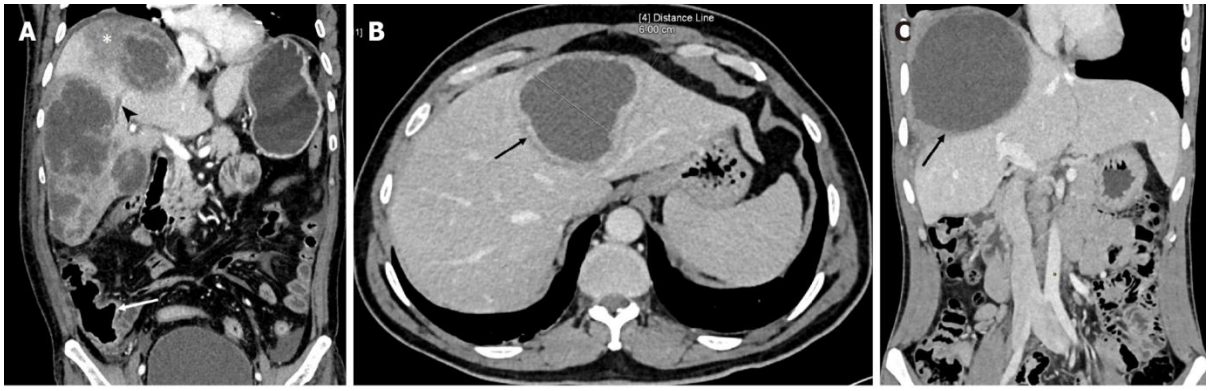


Fig.5: Computed tomography images.[31]

PYOGENIC LIVER ABSCESS

Pyogenic liver abscesses most commonly arise secondary to bacterial seeding from intestinal sources such as appendicitis or diverticulitis, direct extension from cholecystitis or cholangitis, or hematogenous spread from endocarditis. Similar to abscesses in other body sites, hepatic abscesses typically present as complex fluid collections with mixed echogenicity on imaging.

Pathogenesis: In healthy individuals, the liver's reticuloendothelial cells (Kupffer cells) effectively control transient portal bacteremia.

However, in elderly or immunocompromised patients, the bacterial load can overwhelm Kupffer cells, leading to abscess formation.

The development of a pyogenic liver abscess results from the extension of infection through the following pathways:[32]

1. **Portal vein** – Including pylephlebitis of the portal vein.
2. **Hepatic arteries** – As metastatic abscesses.
3. **Direct spread** – From nearby infections.
4. **Trauma** – Leading to bacterial seeding.

5. **Retroperitoneal extension** – Most commonly from suppurative appendicitis.

6. **Ascending biliary infection** – The most common source of pyogenic liver abscess.

The **right lobe** of the liver is most frequently affected due to its laminar blood flow compared to the caudate and left lobes.

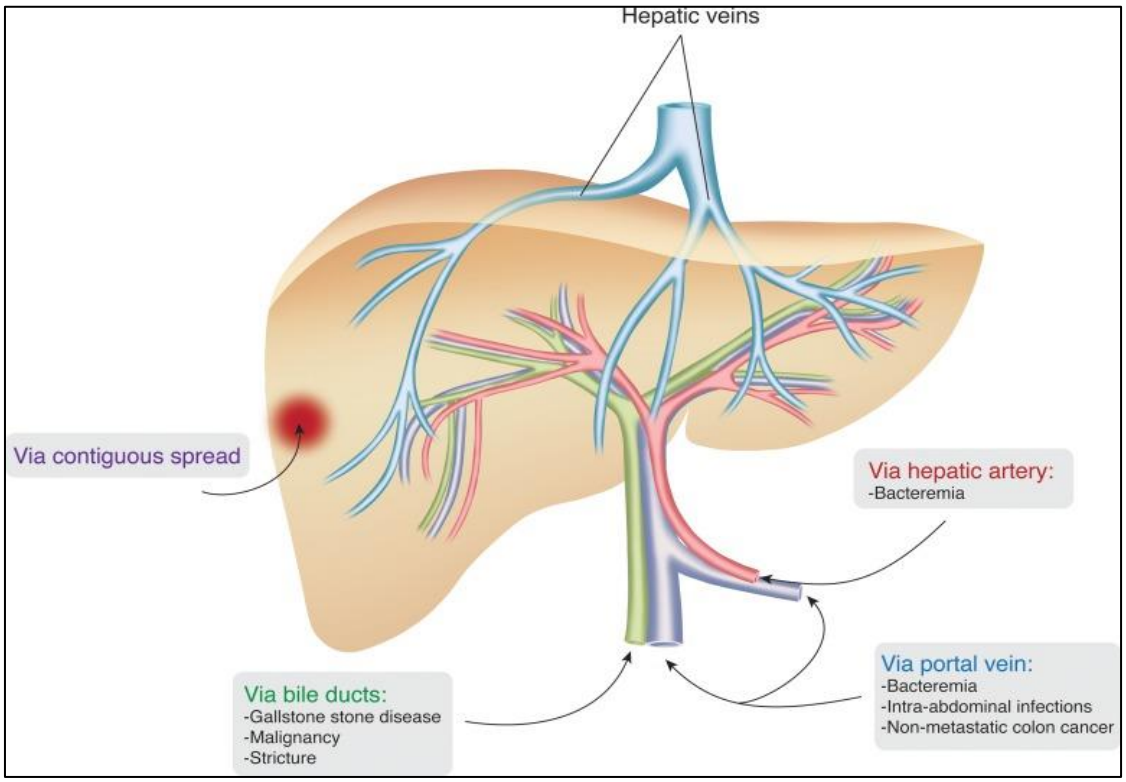


Fig.6: Routes of infection[17]

CLINICAL PRESENTATION: Symptoms of a pyogenic liver abscess are nonspecific and can resemble those of other conditions. Common symptoms include:

- Upper right abdominal pain
- Fever and chills
- Night sweats
- Nausea and vomiting
- Unexplained weight loss
- Jaundice (yellowing of the skin and eyes)
- Right shoulder pain
- Malaise
- Shortness of breath
- Cough

Evaluation:

Physical Examination

- Right upper quadrant tenderness
- Hepatomegaly
- Jaundice
- Right upper quadrant mass
- Ascites
- Pleural effusion or friction rub

Laboratory Investigations

- Elevated alkaline phosphatase
- Total leukocyte count >10,000/mm³
- Albumin <3 g/dL
- Hematocrit <36%
- Bilirubin >2 mg/dL

Imaging Studies:

Radiographic imaging is essential for diagnosing hepatic abscess.

Chest X-ray:

- Abnormal in approximately 50% of cases
- Findings may indicate subdiaphragmatic pathology, including:
    - Right pleural effusion
    - Elevated right hemidiaphragm
    - Atelectasis
- In cases of a left-lobe abscess, left-sided abnormalities may be observed

Abdominal X-ray (Erect):

- Rarely useful but may reveal:
    - Portal venous gas
    - Air-fluid levels

Ultrasonogram whole Abdomen:

- Ultrasound is a valuable diagnostic tool for hepatic abscesses, typically revealing:

- An oval or round hypoechoic (less echogenic) area within the liver
- The ability to differentiate solid from cystic lesions

CT Abdomen (Plain and Contrast):

- CT imaging provides findings similar to ultrasound but with greater sensitivity. Key features include:
- Lesions with lower attenuation than surrounding liver parenchyma
- Detection of very small abscesses (as small as 0.5 cm) and multiple abscesses
- Not limited by air or rib interference
- Abscess wall typically exhibits intense enhancement on contrast-enhanced CT
- Sensitivity for liver abscess diagnosis ranges from 95% to 100%

Differences between Amoebic Liver Abscess and Pyogenic Liver Abscess[33]

Clinical Features	Amoebic Liver Abscess	Pyogenic Liver Abscess
Age (yrs)	20 to 40	>50
Male to Female Ratio	≥ 10:1	1:1
Solitary vs Multiple	Solitary (80%)	Solitary (50%)
Location	Usually right liver	Usually right liver
Travel in Endemic Areas	Yes	No
Diabetes	Uncommon	More Common (27%)
Alcohol Use	Common	Common
Jaundice	Uncommon	Common
Elevated Bilirubin	Uncommon	Common
Elevated Alkaline Phosphatase	Common	Common
Positive Blood Culture	No	Common
Positive Amoebic Culture	Yes	No

Management:

Tissue amebicides form the mainstay of management of all patients with amoebic liver abscess.

Metronidazole, the most widely used nitroimidazole, has been the cornerstone of treatment for uncomplicated amebic liver abscess (ALA) for over four decades. It achieves effective hepatic penetration, and when administered at 500–750 mg three times daily for 7–10 days, symptoms typically resolve within 72 hours. However, as parasites may persist in the colon, Metronidazole treatment should be followed by a luminal agent such as paromomycin (500 mg three times daily for 7 days) or diloxanide furoate (500 mg three times daily for 20 days). Failure to complete luminal therapy can lead to infection relapse in approximately 10% of patients.[28]

Aspiration: Drainage is the primary treatment for pyogenic liver abscesses and can be performed surgically or percutaneously under ultrasound (US) or CT guidance.

When selecting a treatment approach, factors to consider include the patient's anesthetic risk, the presence of coexisting intra-abdominal pathology, the procedure's success rate, and the expertise available in managing these conditions.

Percutaneous needle aspiration involves inserting a 16–18 gauge needle into the abscess cavity and aspirating its contents until complete evacuation is achieved.

The observed advantages of needle aspiration include:

1. Rapid clinical response, particularly in larger lesions (>6 cm in diameter).
2. Ultrasound-guided aspiration of abscesses in uncommon locations.
3. Prevention of rupture in left lobe abscesses, which are more prone to rupture than right lobe abscesses.
4. Faster resolution of fever (quicker defervescence).

Percutaneous Drainage: Percutaneous drainage (PD) offers several advantages, including its minimally invasive nature, eliminating the need for general anesthesia. It also carries a lower risk of adhesion formation and contamination while being more cost-effective than surgical

drainage.[34]

In percutaneous catheter drainage, an 8–14 F pigtail catheter is inserted into the lesion and left in place, allowing drainage by gravity until the abscess is emptied. Studies have shown that percutaneous catheter drainage is more effective than percutaneous needle aspiration, with higher success rates.[15,35]

Open Drainage: The role of surgery in treating amebic liver abscess (ALA) has significantly declined.[36] Surgical intervention is now considered only when radiological approaches fail or are challenging due to location or multiloculation. When surgery is necessary, laparoscopic drainage is preferred over open surgery, as it offers better cosmetic outcomes, faster recovery, shorter hospital stays, fewer surgical site infections, and lower mortality risk. ALA in the caudate lobe is particularly challenging for percutaneous drainage due to its proximity to major vessels, making surgical drainage the recommended approach in such cases.[37]

In their 2022 study, Wadhera et al[8] and his team provided a detailed overview of the contemporary methods used to manage liver abscesses. They meticulously categorized these abscesses into various types, such as infectious, malignant, and iatrogenic, thereby highlighting the diverse range of underlying causes contributing to these conditions. Moreover, the researchers pointed out a notable trend: the highest incidence rates of liver abscesses are observed in Eastern countries, indicating regional variations in the prevalence of this health issue.

Within their review, they extensively discussed the different pathogens implicated in the development of liver abscesses, stressing the significance of understanding the microbial factors involved in devising effective treatment strategies. One of the key findings emphasized in their analysis was the superior efficacy of percutaneous drainage procedures compared to conservative management approaches, underscoring the importance of interventional techniques in the successful treatment of these complex cases.

By offering insights into the latest advancements in the field, Wadhera et al.'s study serves as a valuable resource for healthcare professionals, potentially aiding in the optimization of treatment outcomes for individuals grappling with liver abscesses.

In their 2023 review, Akhondi and Sabih et al[38] provided a comprehensive overview of the pathophysiology, evaluation, and management of liver abscesses. Central to their analysis was the emphasis on interprofessional team strategies, underlining the collaborative approach necessary for effective patient care. Their review underscored the critical importance of accurately identifying different types of liver abscesses and delineated the clinical symptoms indicative of such conditions.

Of particular note was their discussion on the urgency of early detection and prompt management. They illuminated the grave mortality risk associated with untreated liver abscess cases, highlighting the imperative for swift intervention to mitigate adverse outcomes. By shedding light on the intricate interplay between pathophysiology, clinical evaluation, and management strategies, Akhondi and Sabih's review serves as a vital resource for healthcare professionals grappling with this challenging condition.

Their advocacy for interprofessional collaboration underscores the multidisciplinary nature of effective patient care, emphasizing the need for coordinated efforts among healthcare providers to optimize outcomes for individuals affected by liver abscesses. Overall, their review not only enhances our understanding of the complexities surrounding liver abscesses but also advocates for a holistic approach to their evaluation and management, ultimately aiming to improve patient outcomes and reduce mortality rates associated with this condition.

In their 2024 discussion, Sayek and Onat et al[39] delved into both the historical context and contemporary management practices surrounding pyogenic and amebic liver abscesses. They observed a noteworthy decline in the incidence of pyogenic liver abscesses over time and highlighted a significant shift in the primary causes of these abscesses.

Specifically, they noted that biliary tract diseases have become more prevalent than infections spread via the portal route, marking a notable evolution in the epidemiological landscape of this condition. Central to their findings was the critical importance of early diagnosis and appropriate treatment in mitigating mortality rates associated with liver abscesses.

By emphasizing the need for timely intervention, Sayek and Onat underscored the pivotal role of healthcare providers in promptly identifying and addressing liver abscesses to prevent adverse outcomes. Their discussion not only offers valuable insights into the changing trends and etiological factors contributing to liver abscesses but also advocates for a proactive approach to diagnosis and management.

By staying abreast of these evolving patterns and emphasizing the significance of early intervention, healthcare professionals can effectively mitigate the impact of liver abscesses and improve patient outcomes. Sayek and Onat's comprehensive examination thus serves as a crucial resource for clinicians navigating the complexities of liver abscess management in contemporary medical practice.

MATERIAL & METHODS

STUDY TYPE: Observational study

PLACE OF STUDY: Santosh medical college Hospital Ghaziabad

DURATION OF STUDY: 1.5 years

SAMPLE SIZE : 73 in total

Sample size n= (DEFF+Np(1-p)l/[(d?/Z?L.on*(N-1)+p*(1-p)]

STUDY POPULATION: Patients admitted to Santosh Medical College Hospital were diagnosed with liver abscess.

INCLUSION CRITERIA:

- Patients coming to the Emergency/Out Patient Department of Santosh hospital ghaziabad
- Diagnosed as a case of liver abscess on the basis of confirm diagnosis of liver abscess on USG or CT scan
- Managed by single treatment modality (e.g.: either percutaneous needle aspiration was done or percutaneous cather drainage, not both)
- Patients who gave consent for operative intervention, whenever required

EXCLUSION PATIENTS:

- Patients with cavitary lesion of liver in whom USG abdomen or CECT abdomen does not suggest presence of liver abscess.
- No confirm diagnosis of liver abscess.
- Patient requiring both percutaneous needle aspiration and percutaneous catheter drainage.

METHODOLOGY:

This hospital-based study was meticulously conducted at Santosh Medical College and Hospital over a period spanning from July 2023 to January 2025. Throughout this duration, comprehensive data collection and analysis were carried out to ensure the accuracy and reliability of the findings.

This study encompassed a total of 73 patients who were diagnosed with liver abscess. Each patient was systematically evaluated based on clinical presentation, relevant medical history diagnostic findings and laboratory investigations.

The size, volume, site, and degree of liquefaction of the liver abscess were systematically assessed and quantified using ultrasonography (USG). This imaging modality provided precise measurements and detailed visualization, aiding in the selection of the most appropriate treatment approach. The comprehensive evaluation of these parameters played a crucial role in determining the optimal management strategy, ensuring effective management tailored to each patient's condition.

In this study, it was observed that the selection of the treatment modality was influenced by the site, size, volume, and degree of liquefaction of the liver abscess. Based on these parameters, the most suitable intervention was chosen to achieve optimal patient outcomes. The study analyzed the effectiveness of different treatment approaches, including conservative management, percutaneous needle aspiration, percutaneous catheter drainage, and surgical intervention. By correlating these factors with clinical outcomes, the study provided valuable insights into the most effective modality for managing liver abscesses in varying clinical scenarios.

DATA MANAGEMENT AND ANALYSIS:

To effectively manage and analyze data in the study on liver abscess management strategies, comprehensive patient data was collected, including demographic details, clinical characteristics, and specific information about the liver abscesses such as size and location.

This data was organized in a secure digital database with validation features to ensure accuracy. For the analysis, descriptive statistics were initially used to summarize the data. Comparative analyses were then conducted to evaluate the effectiveness of the various treatment methods—conservative medical treatment, percutaneous drainage, laparoscopy drainage, and open surgical drainage—using ANOVA or t-tests for normally distributed data, and non-parametric tests like Kruskal-Wallis for non-normally distributed data.

Time-to-event analysis was applied where the timing of outcomes was relevant. Further, logistic regression or other multivariate techniques were utilized to adjust for confounders such as age and comorbidity status. Subgroup analyses were particularly useful in exploring how different treatments performed across various patient groups.

For data management, platforms like RED Cap were considered, and for statistical analysis, software such as SPSS, R, or SAS were utilized. The findings were discussed within the context of existing literature, study limitations were acknowledged, and clear recommendations based on the results were provided.

RESULTS

Table:1 Descriptive Statistics of Age Distribution Among Study Participants

	Mean	SD	Minimum	Maximum
"Age"	39.3	15.7	8	74

The above table illustrates that out of the total study participants, the mean age is 39.3 years with a standard deviation of 15.7. The age of participants ranges from a minimum of 8 years to a maximum of 74 years.

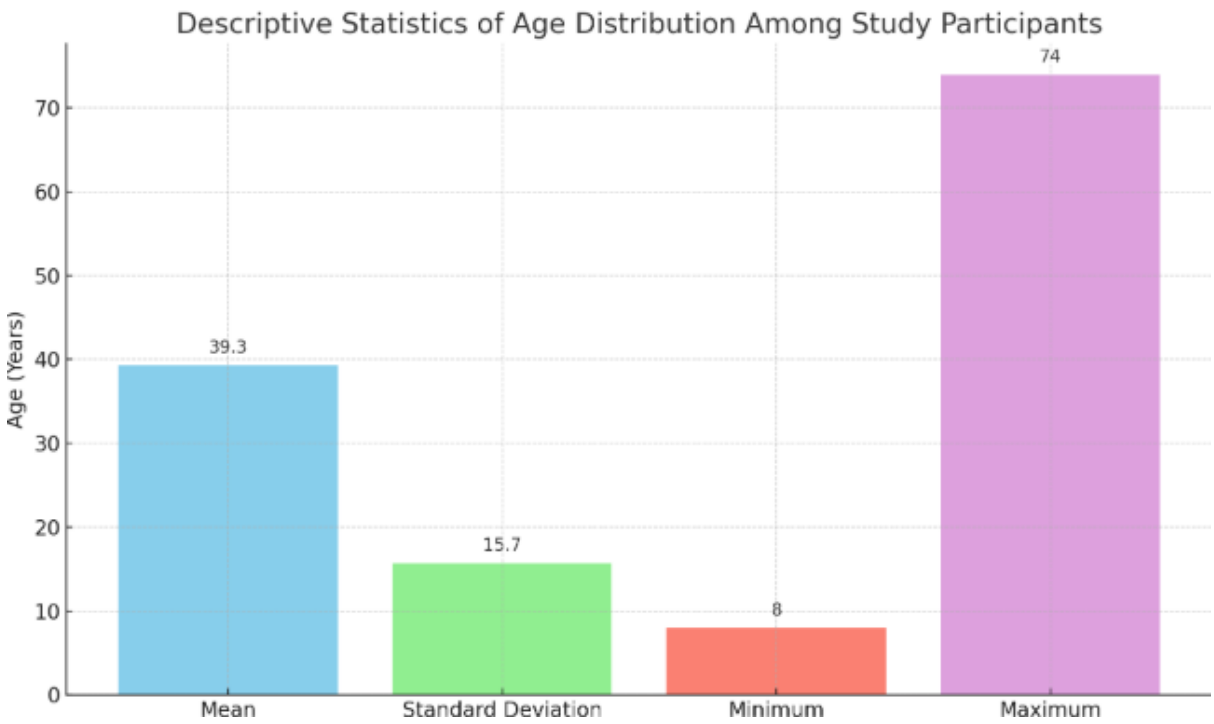


Table:2 Gender-wise Distribution of Study Participants

"Gender"	Counts	% of Total
Male	59	80.8 %
Female	14	19.2 %

The above table illustrates that out of the total study participants, 59 (80.8%) were male and 14 (19.2%) were female.

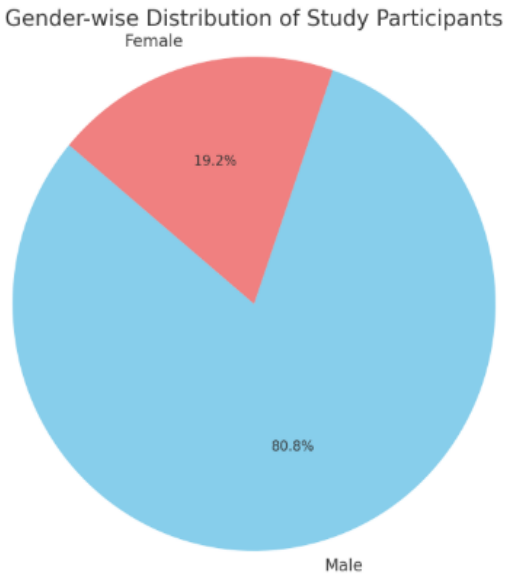


Table:3 Distribution of Common Clinical Symptoms Among Study Participants

Symptom	Response	Counts	% of Total
Abdominal Pain	Yes	68	93.20%
	No	5	6.80%
Vomiting	Yes	35	48.60%
	No	37	51.40%
Fever	Yes	59	80.80%
	No	14	19.20%
Diarrhoea	Yes	33	45.20%
	No	40	54.80%
Jaundice	Yes	4	5.50%
	No	69	94.50%

The above table illustrates that out of the total study participants, 93.20% reported abdominal pain, 48.60% experienced vomiting, 80.80% had fever, 45.20% suffered from diarrhoea, and 5.50% had jaundice. Conversely, 6.80% did not experience abdominal pain, 51.40% did not have vomiting, 19.20% did not report fever, 54.80% did not experience diarrhoea, and 94.50% did not have jaundice.

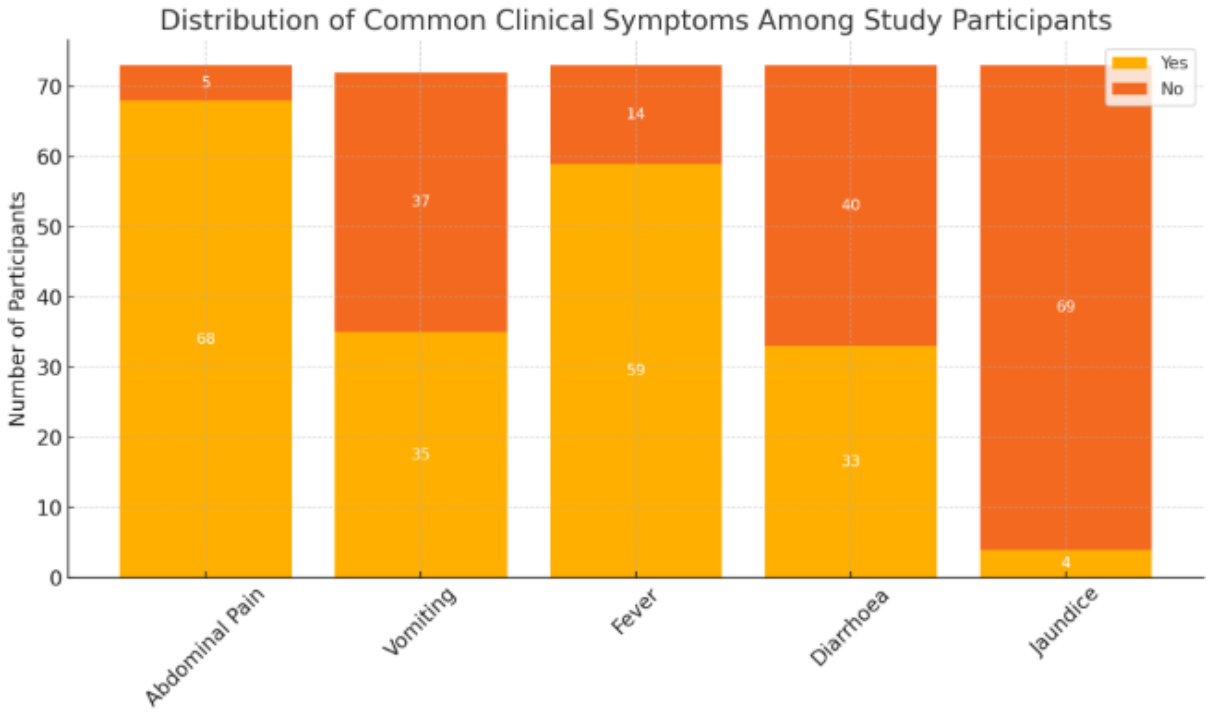


Table:4 Distribution of Other Reported Complaints Among Patients

"Others complaints"	Counts	% of Total
None	54	73.9 %
Generalized body weakness	5	1.4 %
Loss of appetite	1	1.4 %
Obstipation	1	1.4 %
Shortness of breath	1	1.4 %
Abdominal distension	9	11.0 %
Abdominal bloating	3	4.1 %

The analysis of other complaints among the 73 individuals surveyed reveals that the majority, 73.9% (54 out of 73), reported no additional complaints. However, a significant

portion of the population experienced various symptoms. Abdominal distension was the most frequently reported complaint, affecting 12.3% (9 out of 73) of individuals. Generalized body weakness was the second most common symptom, reported by 6.8% (5 out of 73) of individuals. Abdominal bloating was reported by 4.1% (3 out of 73)of individuals. Meanwhile, loss of appetite, obstipation (severe constipation), and shortness of breath were each reported by 1.4% (1 out of 73) of individuals.

Table:5 Distribution of Co-morbidities Among Study Participants

"Co-morbidities"	Counts	% of Total
None	47	64.4 %
Diabetes	17	21.9 %
Hypertension	5	5.48 %
Thyroid Disorder	4	6.85 %

The analysis of co-morbidities among the 73 individuals surveyed reveals that the majority, 64.4% (47 out of 73), do not have any reported co-morbid conditions. However, among those with co-morbidities, diabetes is the most prevalent, affecting 21.9% (17 out of 73) of individuals. This suggests that diabetes is a common health concern in this study.

Table:6 Distribution of Alcohol Consumption Among Study Participants

"alcoholic"	Counts	% of Total
Yes	38	52.1 %
No	35	47.9 %

The above table illustrates that out of the total study participants, 38 (52.1%) were classified as alcoholic, while 35 (47.9%) were non-alcoholic.

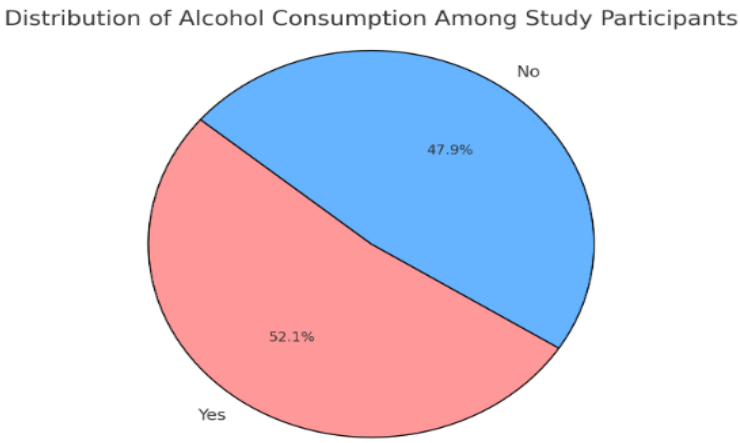


Table:7 Distribution of Heart Rate (HR) Among Patients

"HR"	Counts	% of Total
61-100	37	50.7 %
>100	36	49.3 %

The above table illustrates that out of the total study participants, 50.7% had a heart rate (HR) in the range of 61-100, while 49.3% had a heart rate greater than 100.

Table:8 Distribution of Respiratory Rate (RR) Among Patients

"RR"	Counts	% of Total
19-24	63	85.9 %
>24	10	14.1 %

The above table illustrates that out of the total study participants, 85.9% had a respiratory rate (RR) between 19-24, while 14.1% had an RR greater than 24.

"SBP"	Counts	% of Total
<100	16	21.9 %
101-120	55	75.3 %
>140	2	2.7 %

Table:9 Distribution of Systolic Blood Pressure (SBP) Among Study Participants

The above table illustrates that out of the total study participants, 21.9% had a systolic blood pressure (SBP) of less than 100, 75.3% had an SBP ranging from 101 to 120, and 2.7% had an SBP greater than 140.

Table:10 Distribution of Diastolic Blood Pressure (DBP) Among Study Participants

"DBP"	Counts	% of Total
<70	16	21.9 %
71-100	55	75.3 %
>100	2	2.7 %

The above table illustrates that out of the total study participants, 21.9% had a Diastolic Blood Pressure (DBP) of less than 70, 75.3% had a DBP ranging from 71 to 100, and 2.7% had a DBP greater than 100.

"SpO2"	Counts	% of Total
<94	9	12.7 %
95-100	64	87.3 %

Table:11 Distribution of SpO_2 Levels Among Study Participants

The above table illustrates that out of the total study participants, 12.7% had SpO_2 levels of <94, while 87.3% had SpO_2 levels between 95-100.

Table:12 Distribution of Body Temperature Among Patients

"Temperature"	Counts	% of Total
98 - 99°F	14	19.18%
>99°F	59	80.82%

The above table illustrates that out of the total study participants, 19.18% had a body temperature between 98-99°F, while 80.82% had a body temperature greater than 99°F.

Table:13 Distribution of Total Leukocyte Count (TLC) Among Study Participants

"Total Leukocyte count (TLC)"	Counts	% of Total
<10,000	4	5.5 %
10,000-15,000	10	13.7 %
15,000-20,000	22	30.1 %
20,000-25,000	19	26.0 %
25,000-30,000	12	16.4 %
>30,000	6	8.2 %

The above table illustrates that out of the total study participants, 5.5% had a total leukocyte count (TLC) of less than 10, 13.7% had a TLC between 10 and 15, 30.1% had a TLC between 15 and 20, 26.0% had a TLC between 20 and 25, 16.4% had a TLC between 25 and 30, and 8.2% had a TLC greater than 30. In 94.52(69 out of 73) of patients, an increased total leucocyte count was observed.

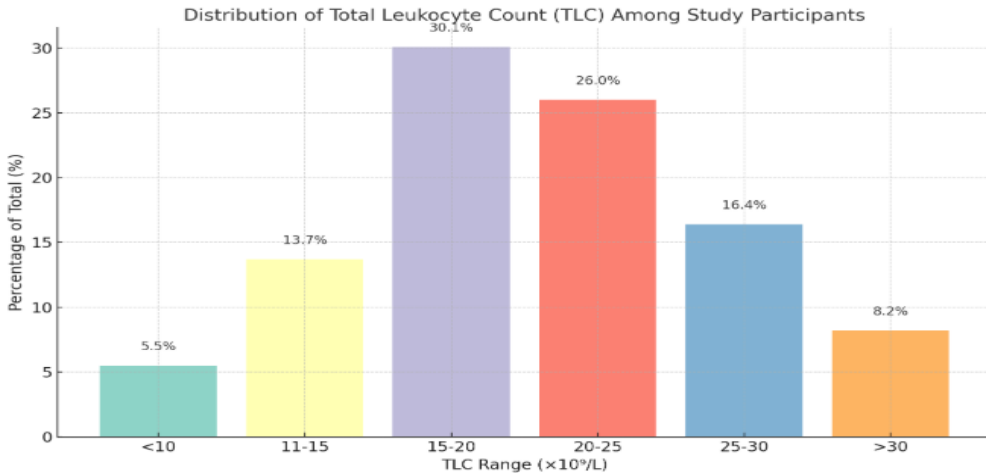


Table:14 Distribution of Serum Bilirubin Levels Among Study Participants

"Bilirubin"	Counts	% of Total
<1.2	72	98.6 %
1.2-2.5	1	1.4 %

The above table illustrates that out of the total study participants, 98.6% had serum bilirubin levels less than 1.2, while 1.4% had serum bilirubin levels between 1.2 and 2.5.

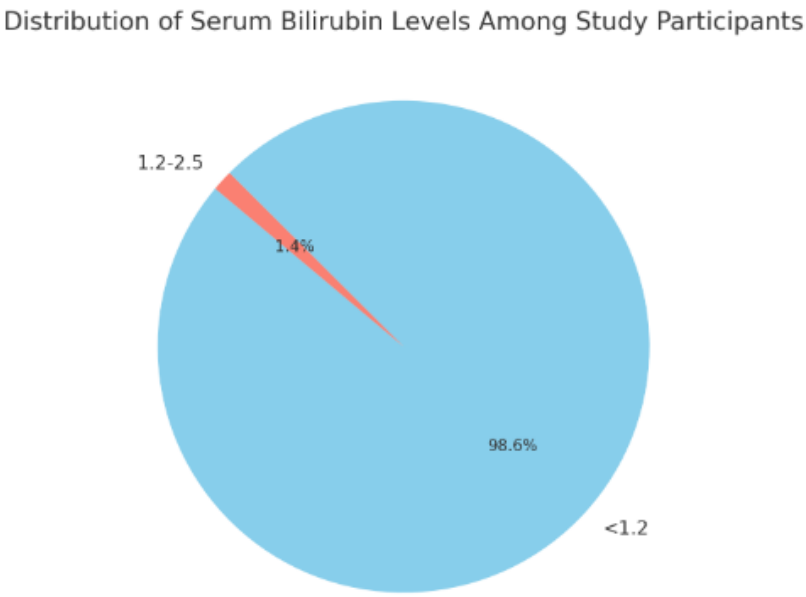


Table:15 Distribution of Serum Albumin Levels Among Study Participants

"Albumin"	Counts	% of Total
<2.5	1	1.4 %
2.5-3.5	11	15.3 %
3.5-5	61	83.3 %

The above table illustrates that out of the total study participants, 1 (1.4%) had serum albumin levels below 2.5, 11 (15.3%) had levels between 2.5 and 3.5, and 61 (83.3%) had levels between 3.5 and 5.

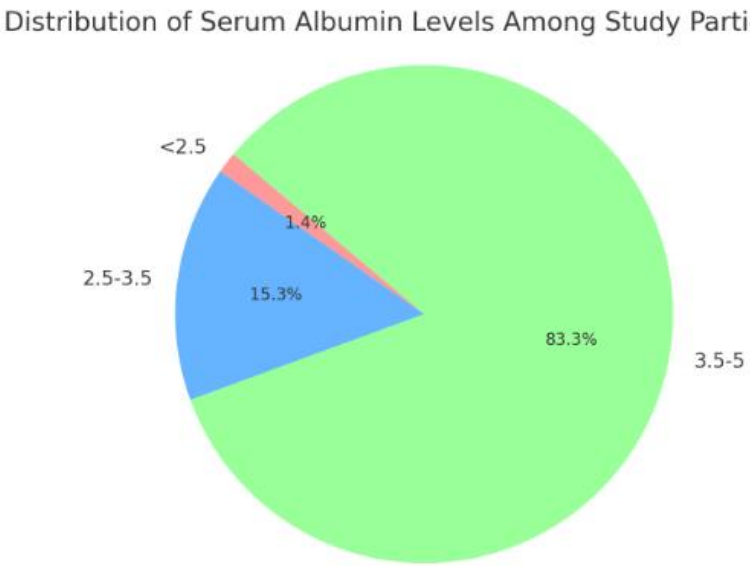


Table:16 Distribution of Patients According to Abscess Size (in ml)

"Abscess Size (ml)"	Counts	% of Total
<100	7	9.6 %
101-200	6	8.2 %
201-300	6	8.2 %
301-400	13	17.8 %
401-500	12	16.4 %
501-600	8	11.0 %
601-700	6	8.2 %
701-800	6	8.2 %
801-900	2	2.7 %
901-1000	1	1.4 %
>1000	6	8.2 %

The above table illustrates that out of the total study participants, 9.6% had abscess sizes less than 100 ml, 8.2% had abscess sizes between 101-200 ml, 8.2% had abscess sizes between 201-300 ml, 17.8% had abscess sizes between 301-400 ml, 16.4% had abscess sizes between 401-500 ml, 11.0% had abscess sizes between 501-600 ml, 8.2% had abscess sizes between 601-700 ml, 8.2% had abscess sizes between 701-800 ml, 2.7% had abscess sizes between 801-900 ml, 1.4% had abscess sizes between 901-1000 ml, and 8.2% had abscess sizes greater than 1000 ml.

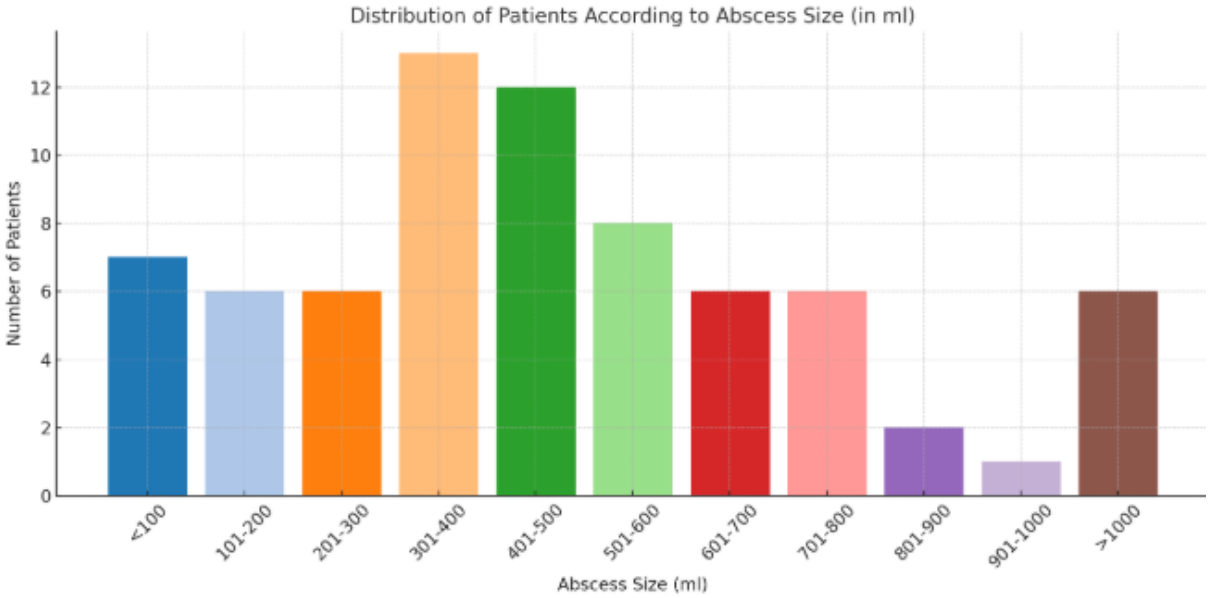


Table:17 Distribution of Lesion Sites in Liver Involvement

"Site"	Counts	% of Total
Right Lobe	60	82.2 %
Left Lobe	9	12.3 %
Both	4	5.5 %

The above table illustrates that out of the total study participants, 82.2% had lesions in the right lobe, 12.3% had lesions in the left lobe, and 5.5% had lesions in both lobes.

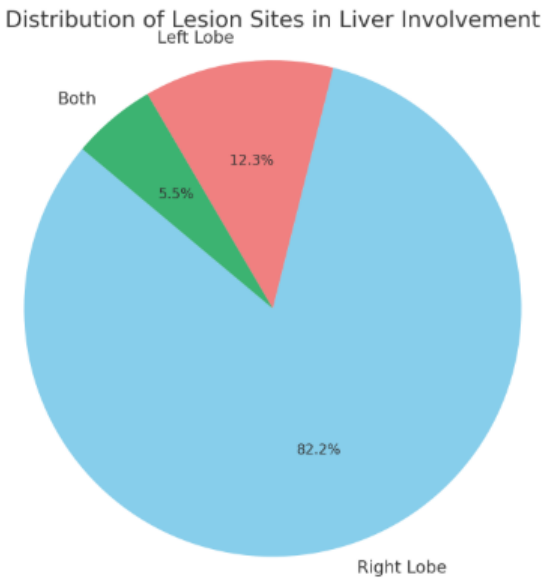


Table:18 Distribution of Patients Based on Number of Cavities

"Number of cavity"	Counts	% of Total
Single	64	87.5 %
Multiple	9	12.5 %

The above table illustrates that out of the total study participants, 87.5% had a single cavity, while 12.5% had multiple cavities.

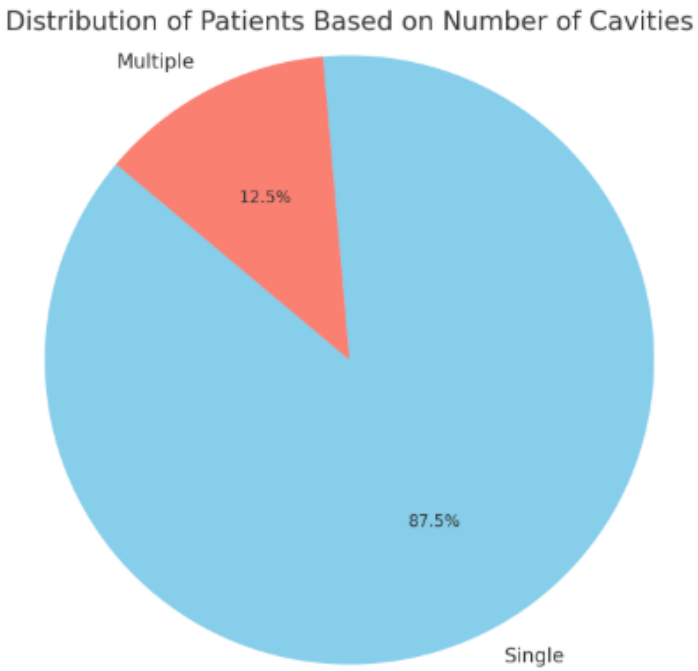


Table:19 Distribution of Septations Among Study Participants

"Septations"	Counts	% of Total
No	67	91.8 %
Yes	6	8.2 %

The above table illustrates that out of the total study participants, 91.8% had no septations, while 8.2% had septations.

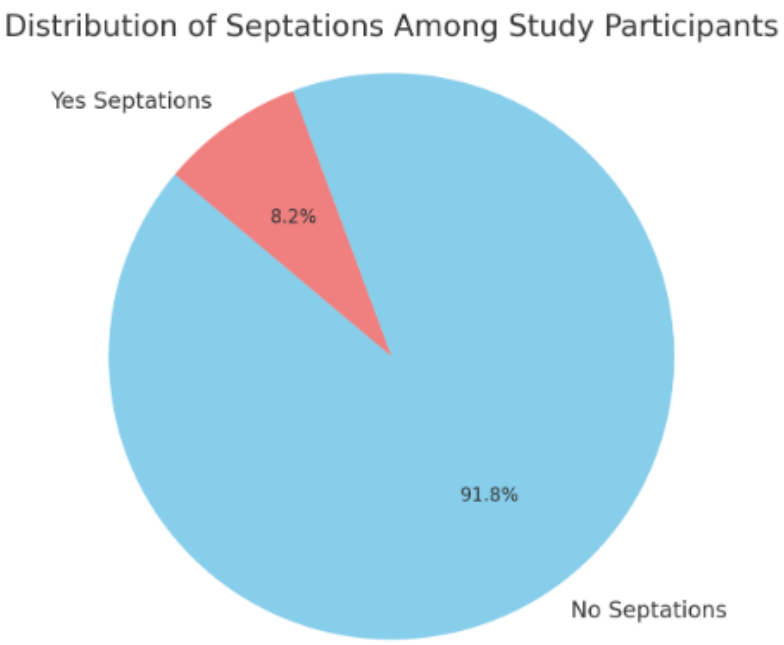


Table:20 Distribution of Ruptured vs. Non-Ruptured Cases Among Patients

"Ruptured"	Counts	% of Total
No	59	80.8 %
Yes	14	19.2 %

The above table illustrates that out of the total study participants, 59 (80.8%) had non-ruptured cases, while 14 (19.2%) had ruptured cases.

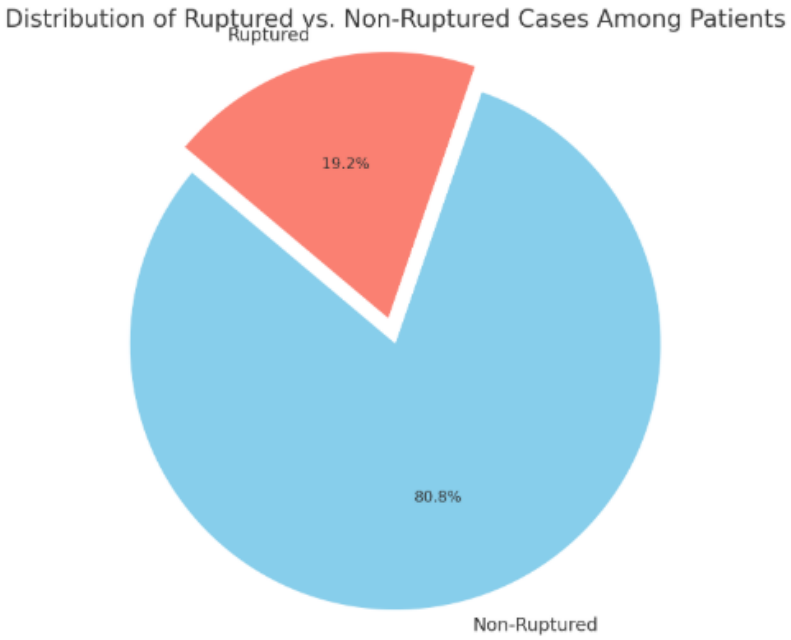


Table:21 Distribution of Patients Undergoing Medical Management

"Medical management"	Counts	% of Total
No	63	86.3 %
Yes	10	13.7 %

The above table illustrates that out of the total study participants, 86.3% did not undergo medical management, while 13.7% were administered medical management.

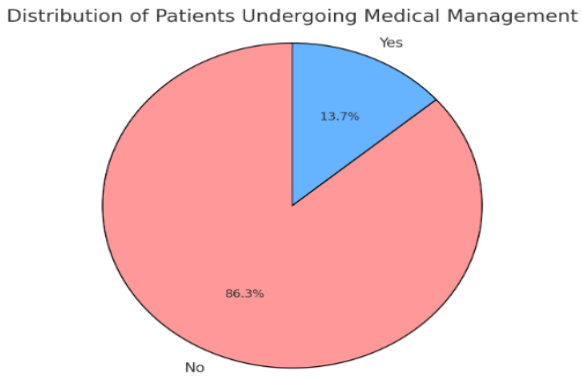


Table:22 Frequency of USG-Guided Needle Aspiration Among Study Participants

"USG Guided Needle aspiration"	Counts	% of Total
No	69	94.5 %
Yes	4	5.5 %

The above table illustrates that out of the total study participants, 69 (94.5%) did not undergo USG-guided needle aspiration, while 4 (5.5%) participants underwent the procedure.

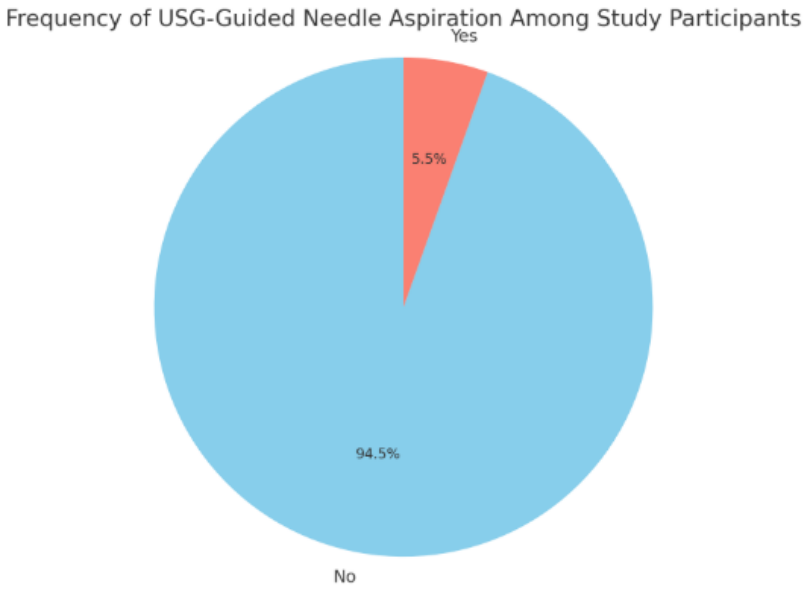


Table:23 Distribution of Patients Undergoing USG-Guided Pigtail Catheterization

"USG Guided pigtail catheterization"	Counts	% of Total
Yes	41	56.2 %
No	32	43.8 %

The above table illustrates that out of the total study participants, 56.2% underwent USG-guided pigtail catheterization, while 43.8% did not.

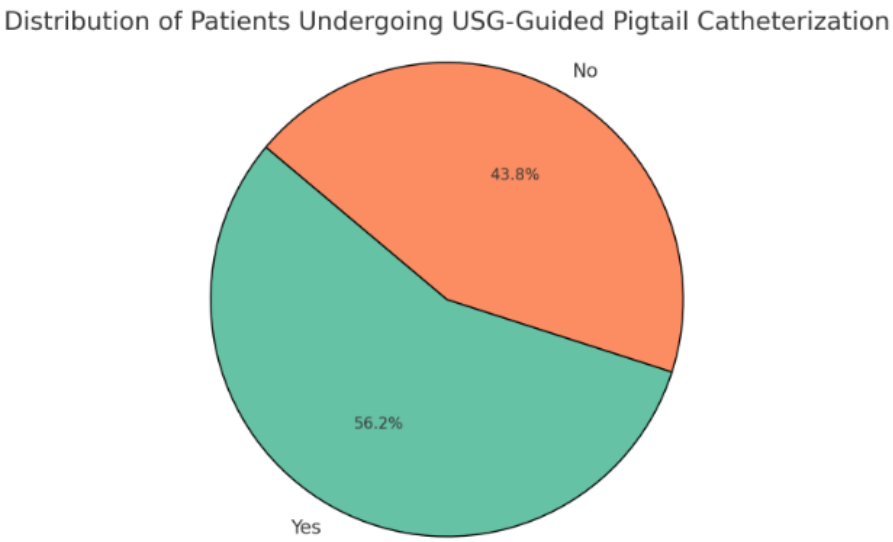


Table:24 Distribution of Patients Undergoing Laparoscopic Drainage

"Laparoscopic Drainage"	Counts	% of Total
No	63	86.3 %
Yes	10	13.7 %

The above table illustrates that out of the total study participants, 86.3% underwent no laparoscopic drainage, while 13.7% underwent laparoscopic drainage.

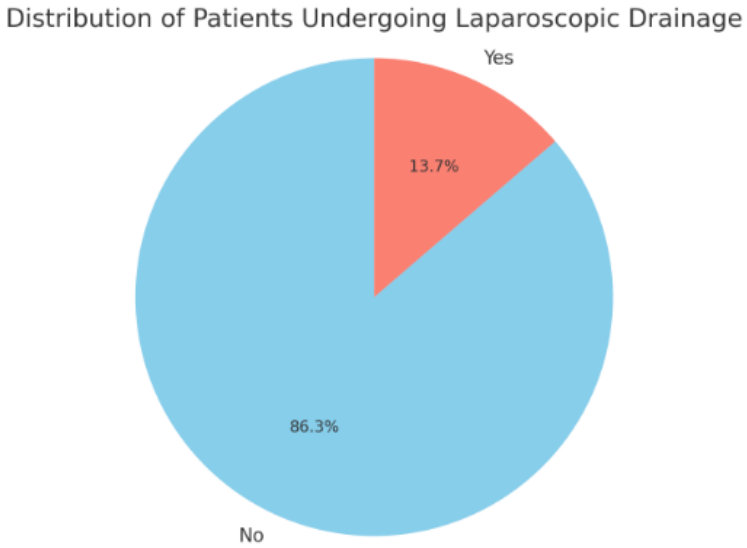


Table:25 Distribution of Patients Based on Presence of Open Drainage

"Open Drainage"	Counts	% of Total
No	65	87.7 %
Yes	8	12.3 %

The above table illustrates that out of the total study participants, 87.7% (64 patients) did not have open drainage, while 12.3% (9 patients) had open drainage.

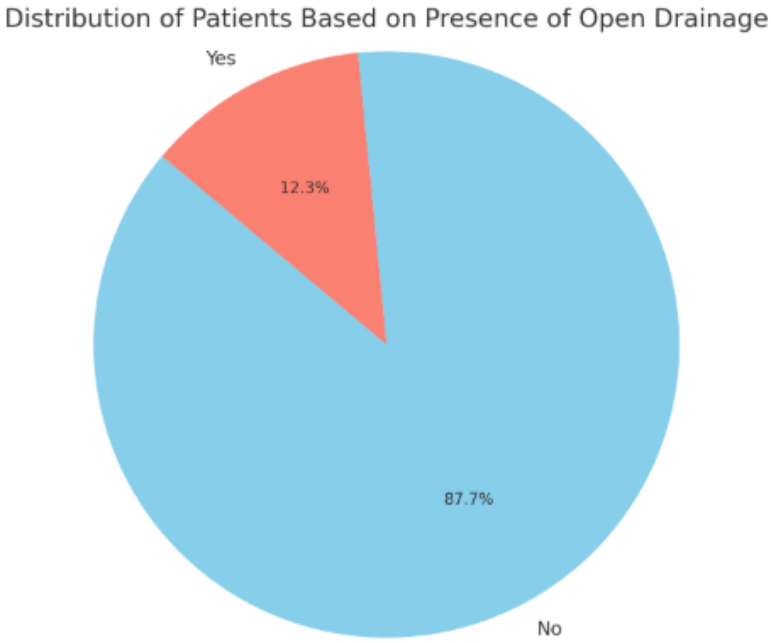


Table:26 Distribution of Liquified Abscess Findings Among Study Participants

"Liquified abscess"	Counts	% of Total
No	16	21.9 %
Yes	55	75.3 %
Partial	2	2.7 %

The above table illustrates that out of the total study participants, 16 (21.9%) had no liquified abscess, 55 (75.3%) had a liquified abscess, and 2 (2.7%) had a partial liquified abscess.

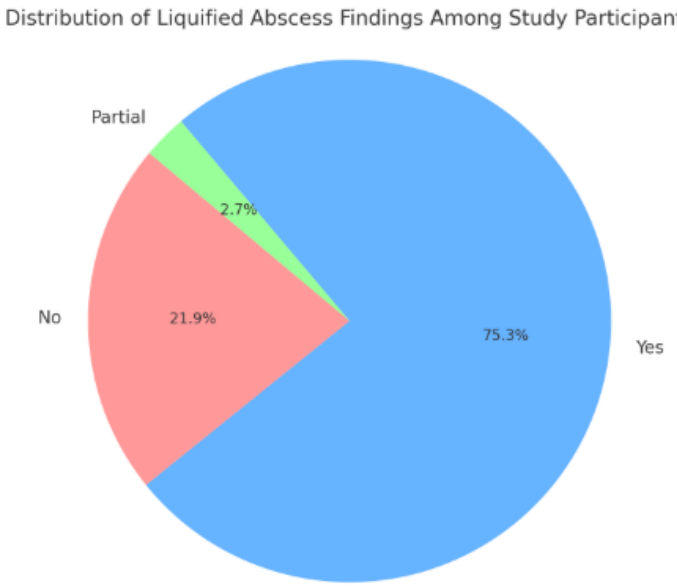


Table:27 Correlation Between Treatment Modalities and Presence of Liquefied Abscess in Patients

"Modalites of treatment"	"Liquified abscess"	Counts	% of Total	P
USG Guided pigtail catheterization	No	2	2.7 %	< .001
	Yes	39	53.4 %	
	Partial	0	0.0 %	
Open drainage	No	2	2.7 %	
	Yes	4	5.5 %	
	Partial	2	2.7 %	
USG Guided aspiration	No	1	1.4 %	
	Yes	3	4.1 %	
	Partial	0	0.0 %	
Laparoscopic drainage	No	2	2.7 %	
	Yes	8	11.0 %	
	Partial	0	0.0 %	
Medical Management	No	10	13.7 %	
	Yes	0	0.0 %	
	Partial	0	0.0 %	
	Yes	0	0.0%	
	Partial	0	0.0 %	

- USG Guided Pigtail Catheterization:

  - This was the most commonly used treatment for patients with liquefied abscess (39 patients, 53.4%).
  - A very small number of patients (2, 2.7%) did not have a liquefied abscess.
  - No patients showed partial liquefaction.

 Open Drainage:

- A total of 4 patients (5.5%) had a liquefied abscess and were treated with open drainage.
- 2 patients (2.7%) did not have a liquefied abscess, while another 2 patients (2.7%) showed partial liquefaction.

 USG Guided Aspiration:

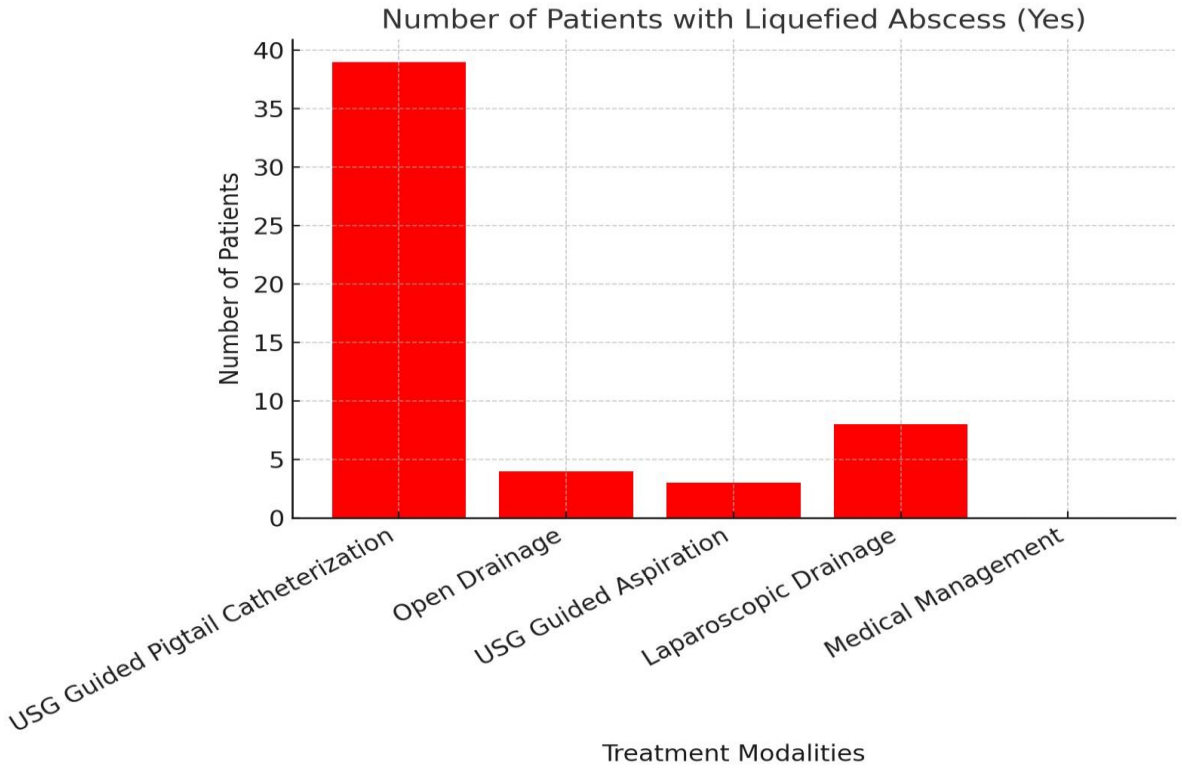
- 3 patients (4.1%) had a liquefied abscess and received this treatment.
- 1 patient (1.4%) did not have a liquefied abscess.
- No patients had partial liquefaction.

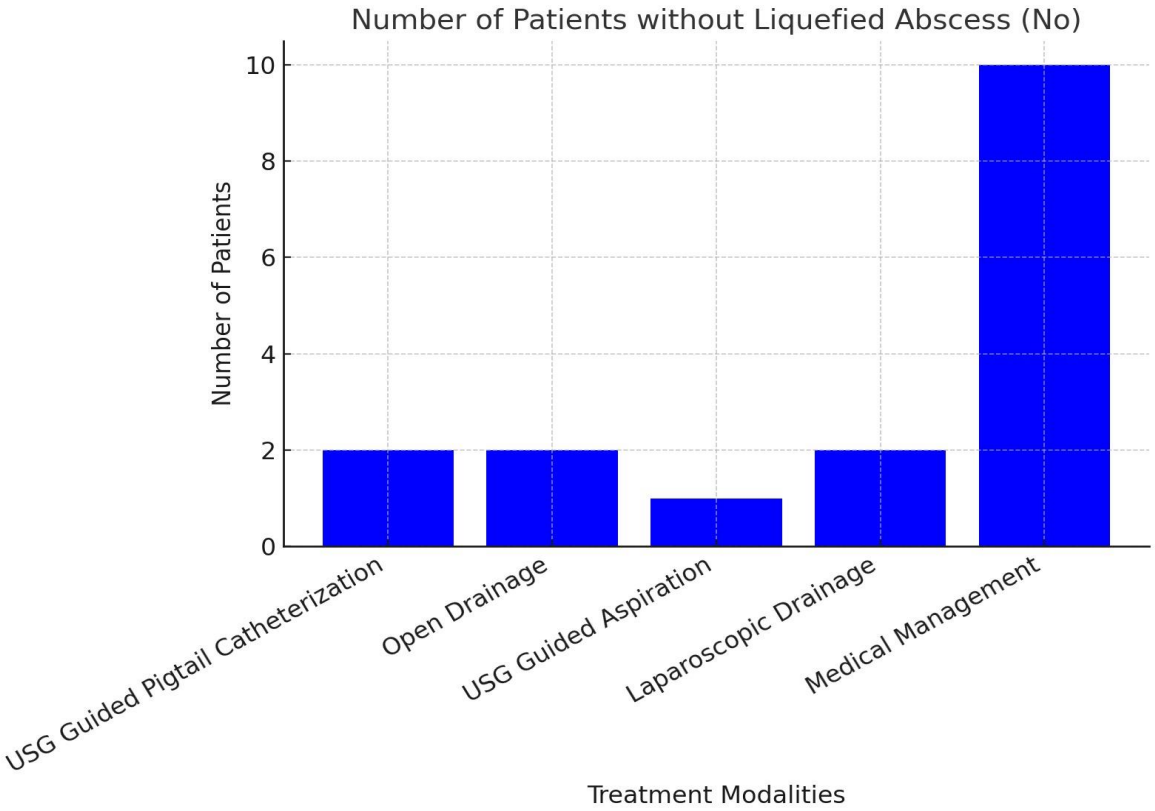
 Laparoscopic Drainage:

- 8 patients (11.0%) with liquefied abscess underwent laparoscopic drainage.
- 2 patients (2.7%) did not have a liquefied abscess.
- No cases of partial liquefaction were reported.

 Medical Management:

- 10 patients (13.7%) did not have a liquefied abscess and were managed medically.
- No patients had a liquefied abscess (Yes = 0%).
- No cases of partial liquefaction were reported


Number of Patients with Liquefied Abscess (Yes)
Number of Patients
0
5
10
15
20
25
30
35
40
USG Guided Pigtail Catheterization
Open Drainage
USG Guided Aspiration
Laparoscopic Drainage
Medical Management
Treatment Modalities


Number of Patients without Liquefied Abscess (No)
Number of Patients
0
2
4
6
8
10
USG Guided Pigtail Catheterization
Open Drainage
USG Guided Aspiration
Laparoscopic Drainage
Medical Management
Treatment Modalities

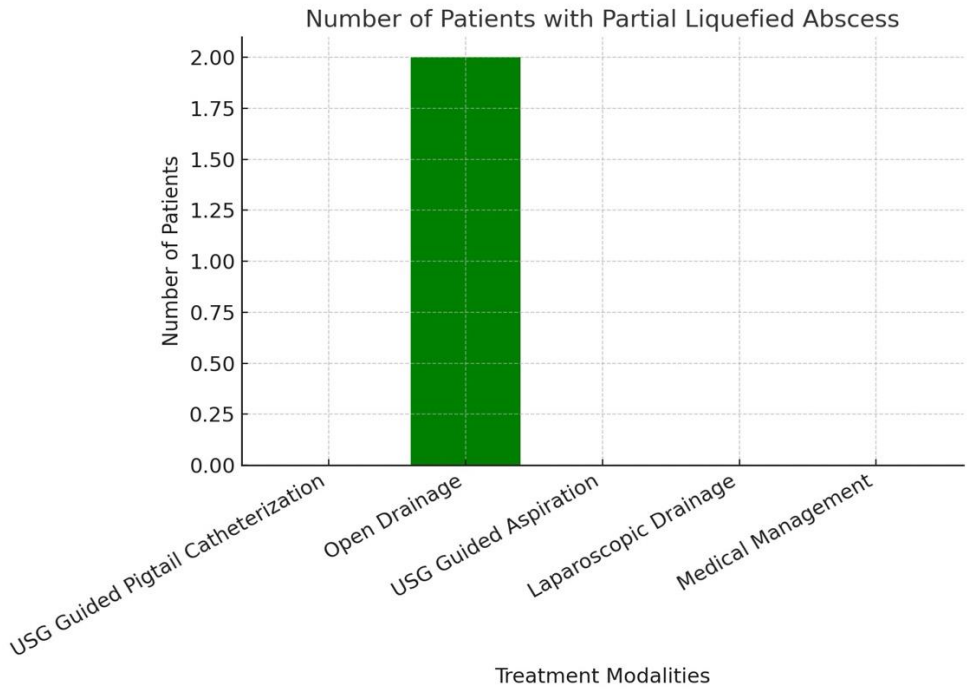


Table:28: Different treatment modalities

Treatment Modality	Yes (Count)	Yes (% of Total)	No (Count)	No (% of Total)
Medical Management	10	13.70%	63	86.30%
USG Guided Needle Aspiration	4	5.50%	69	94.50%
USG Guided Pigtail Catheterization	41	56.20%	32	43.80%
Laparoscopic Drainage	10	13.70%	63	86.30%
Open Drainage	8	12.30%	65	87.70%

1. Medical Management:
    - A majority of patients (63 out of 73, 86.3%) did not receive medical management.
    - Only 10 patients (13.7%) were treated with this approach.
2. USG Guided Needle Aspiration:
    - This treatment was the least utilized, with only 4 patients (5.5%) receiving it.

- Most patients (69 out of 73, 94.5%) did not undergo this procedure.

3. USG Guided Pigtail Catheterization:
   - This was the most frequently used treatment, with 41 patients (56.2%) undergoing the procedure.
   - However, 32 patients (43.8%) did not receive this intervention.
4. Laparoscopic Drainage:
   - Only 10 patients (13.7%) underwent laparoscopic drainage.
   - The majority, 63 patients (86.3%), did not receive this treatment.
5. Open Drainage:
   - A total of 8 patients (12.3%) received open drainage.
   - Most patients (65 out of 73, 87.7%) did not undergo this procedure.

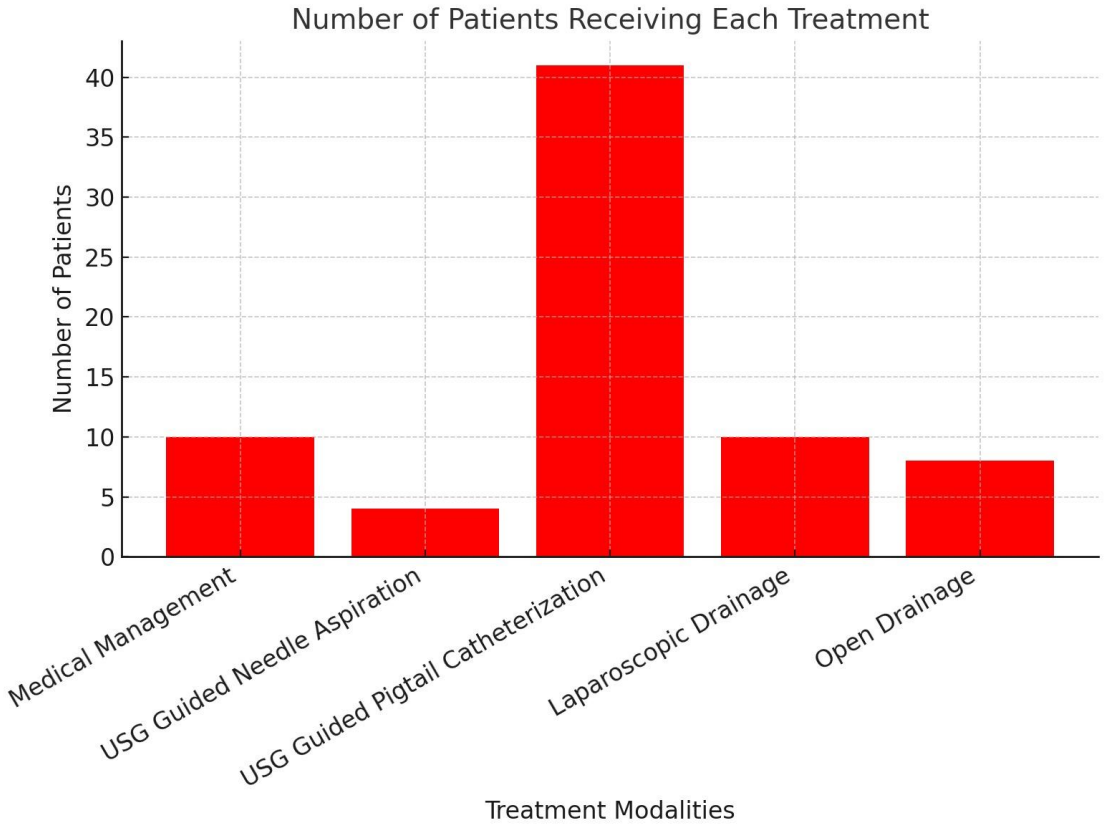


Table:29 Association Between Treatment Modalities and Ruptured Status in Patients with Intra-Abdominal Collections

		"Ruptured"			
"Modalities of treatment"		**No**	**Yes**	**Total**	**P**
USG Guided pigtail catheterization	Observed	41(69.5 %)	0(0.0 %)	41(56.2 %)	< .001
Open drainage	Observed	2(3.4 %)	6(42.9 %)	8(11.0 %)	
USG Guided aspiration	Observed	4(6.8 %)	0(0.0 %)	4(5.5 %)	
Laparoscopic drainage	Observed	2(3.4 %)	8(50.0 %)	10(12.3 %)	
Medical Management	Observed	10(16.9 %)	0(0.0 %)	10(13.7 %)	
Total	Observed	59(100.0 %)	14(100.0 %)	73(100.0 %)	

In this study USG Guided Pigtail Catheterization was used in 41 patients (69.5%) under the No category, while none were in the Yes category. This treatment accounted for 56.2% of the total cases.

Open Drainage was performed in 8 patients (11.0%), with 2 patients (3.4%) in the No category and 6 patients (42.9%) in the Yes category, indicating a higher proportion in the Yes group.

USG Guided Aspiration was observed in 4 patients (5.5%), all of whom were in the No category (6.8%), with none (0.0%) in the Yes category.

Laparoscopic Drainage was utilized in 10 cases (12.3%), with 2 patients (3.4%) in the No category and 8 patients (50.0%) in the Yes category, showing that this method was predominantly used in the Yes category.

Medical Management was recorded in 10 cases (13.7%), with all 10 patients (16.9%) in the No category and none in the Yes category (0.0%).

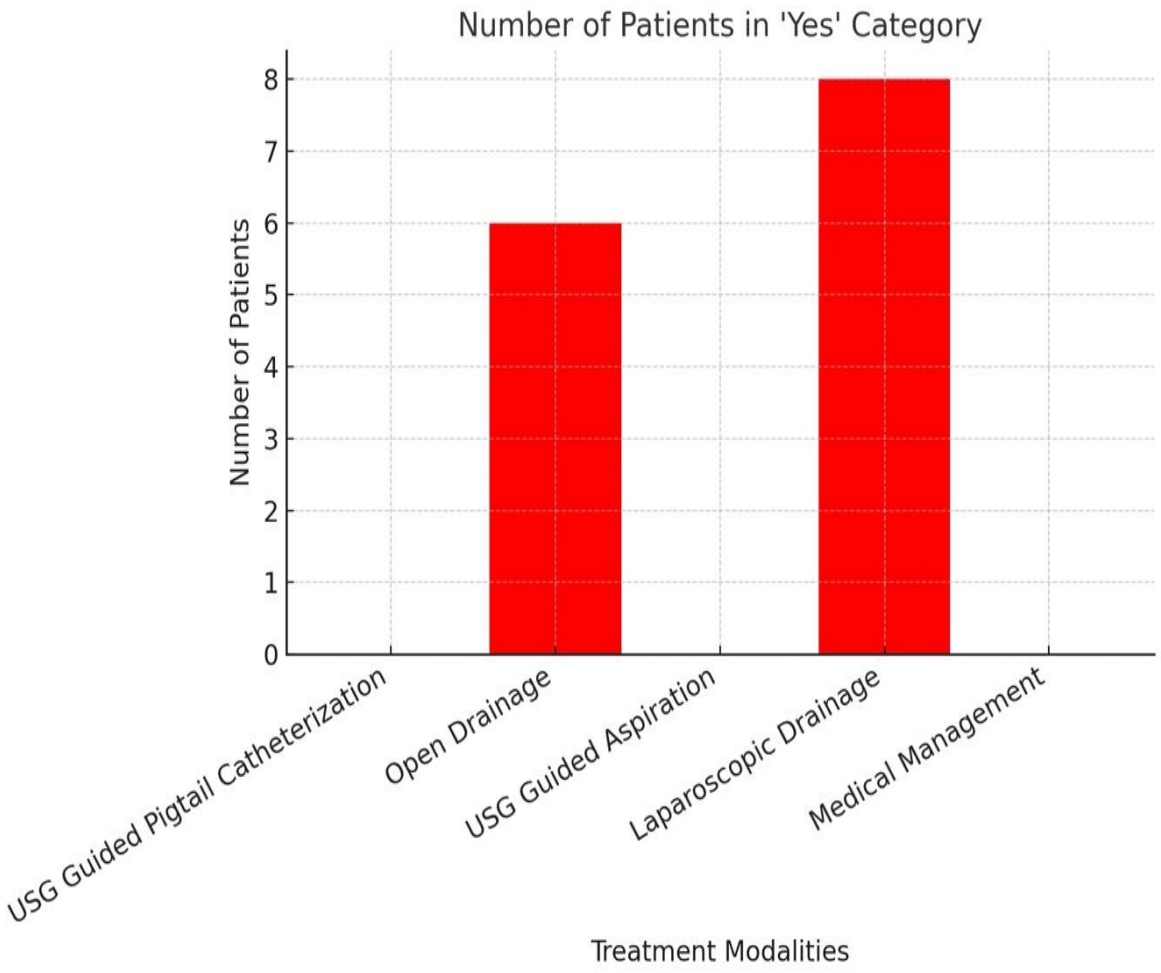


Table:30 Association Between Presence of Septations and Modalities of Treatment in Patients with Intra-abdominal Collections

		"Septations"			
"Modalities of treatment"		**No**	**Yes**	**Total**	**P**
USG Guided pigtail catheterization	Observed	41(61.2 %)	0(0.0 %)	41(56.2 %)	< .001
Open drainage	Observed	4(6.0 %)	4(66.7 %)	8(11.0 %)	
USG Guided aspiration	Observed	4(6.0 %)	0(0.0 %)	4(5.5 %)	
Laparoscopic drainage	Observed	8(10.4 %)	2(33.3 %)	10(12.3 %)	
Medical Management	Observed	10(14.9 %)	0(0.0 %)	10(13.7 %)	
Total	Observed	68(100.0 %)	6(100.0 %)	73(100.0 %)	

The data shows that USG Guided Pigtail Catheterization was the most common treatment modality, with 41 cases (61.2%) in the "No" category and 0 cases (0.0%) in the "Yes" category, making up 56.2% of the total cases.

Open Drainage was observed in 8 cases (11.0%), with an equal split between the "No" category (4 cases, 6.0%) and the "Yes" category (4 cases, 66.7%).

USG Guided Aspiration had 4 cases (5.5%) in total, all falling under the "No" category (4 cases, 6.0%) with none in the "Yes" category (0.0%).

For Laparoscopic Drainage, 10 cases (12.3%) were recorded, with 8 cases (10.4%) in the "No" category and 2 cases (33.3%) in the "Yes" category. Lastly, Medical

Management accounted for 10 cases (13.7%), all of which were in the "No" category (10 cases, 14.9%) with 0 cases (0.0%) in the "Yes" category.

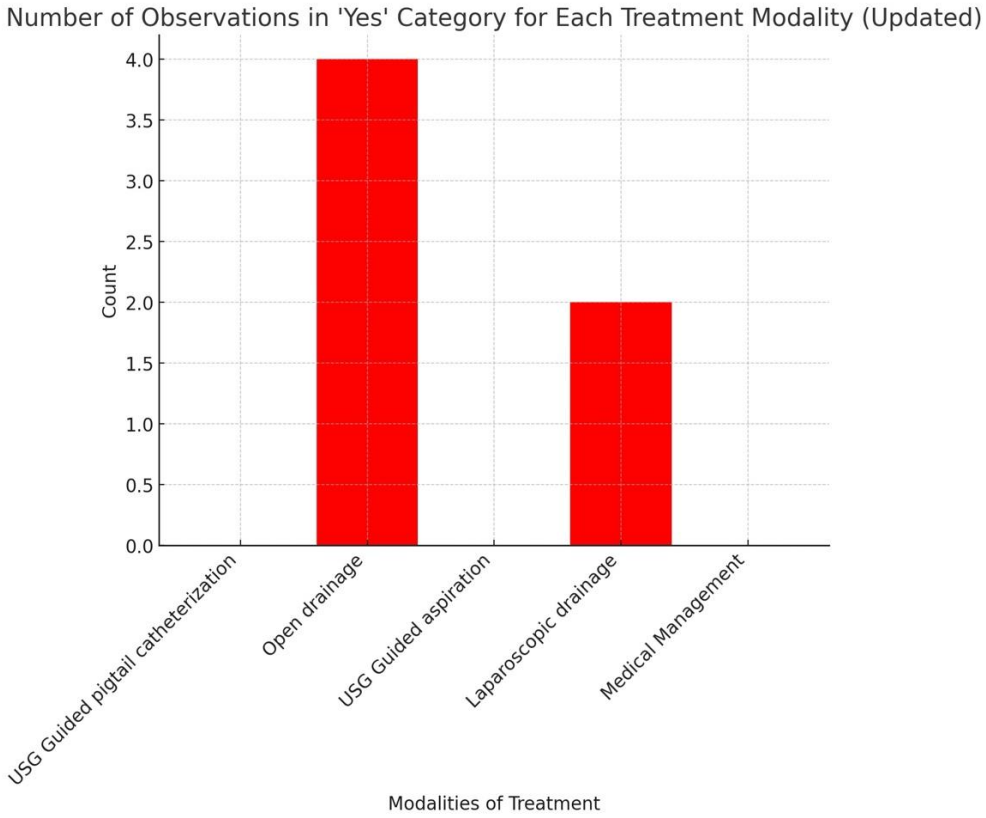


Table:31 Association Between Number of Cavities and Modalities of Treatment in Patients with Intra-abdominal Collections

		"Number of cavity"			
"Modalities of treatment"		**Single**	**Multiple**	**Total**	**P**
USG Guided pigtail catheterization	Observed	40(63.5 %)	0(0.0 %)	40(55.6 %)	< .001
Open drainage	Observed	3(4.8 %)	5(55.6 %)	8(11.1 %)	
USG Guided aspiration	Observed	4(6.3 %)	0(0.0 %)	4(5.6 %)	
Laparoscopic drainage	Observed	7(11.1 %)	3(22.2 %)	10(12.5 %)	
Medical Management	Observed	9(14.3 %)	1(11.1 %)	10(13.9 %)	
Total	Observed	63(100.0 %)	9(100.0 %)	72(100.0 %)	

In this study USG Guided Pigtail Catheterization was the most commonly used treatment, with 40 cases (63.5%) in the Single category and none in the Multiple category, making up 55.6% of the total cases.

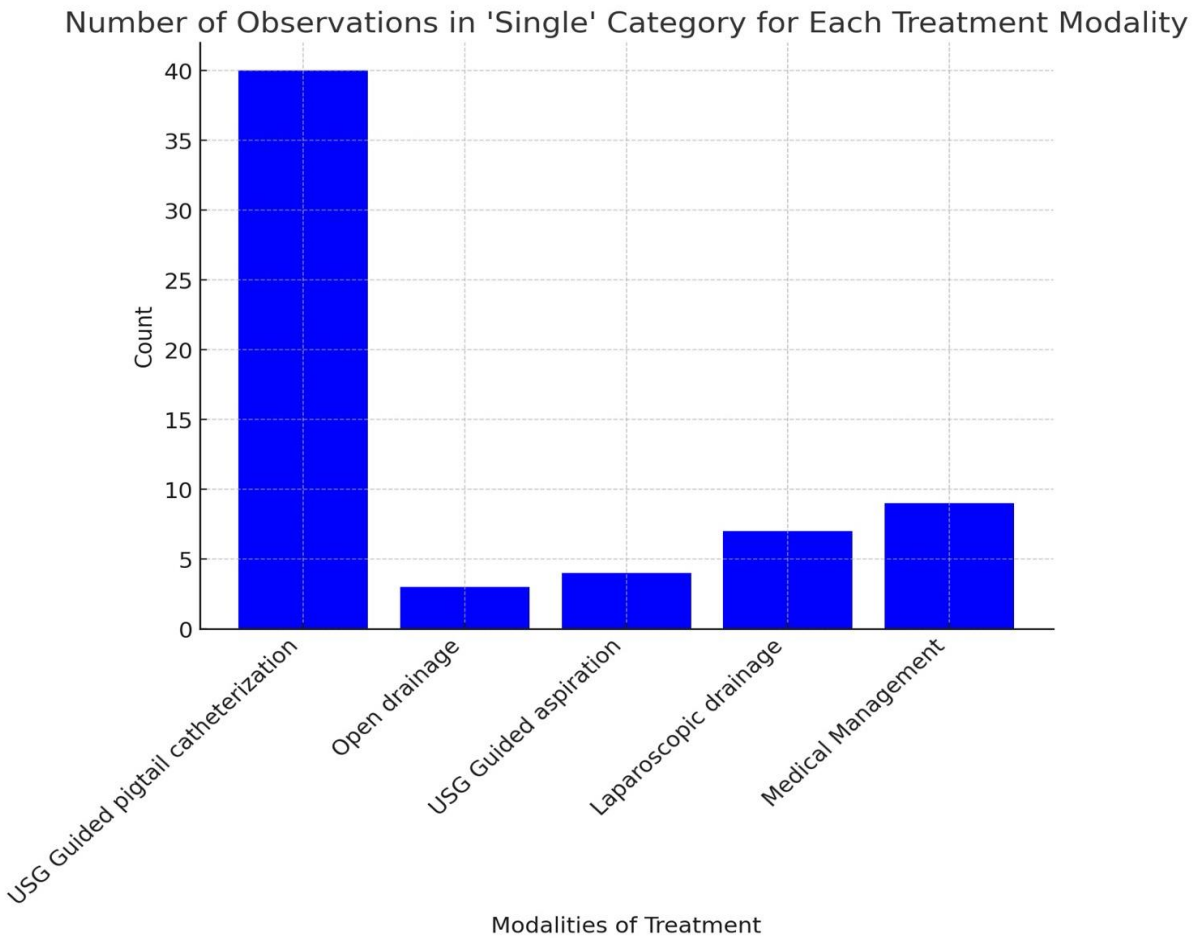
Open Drainage was observed in 8 cases (11.1%), with 3 cases (4.8%) in the Single category and 5 cases (55.6%) in the Multiple category, indicating that this treatment was frequently combined with others.

USG Guided Aspiration was exclusively seen in the Single category, with 4 cases (6.3%), and had no cases in the Multiple category.

Laparoscopic Drainage accounted for 10 cases (12.5%), with 7 cases (11.1%) in the Single category and 3 cases (22.2%) in the Multiple category.

Medical Management was recorded in 10 cases (13.9%), with 9 cases (14.3%) in the Single category and 1 case (11.1%) in the Multiple category.

Overall, the Single category had a significantly higher number of cases (63 cases, 86.3%), while the Multiple category accounted for only 9 cases (12.3%), suggesting that most patients received only one type of treatment rather than a combination of multiple modalities.



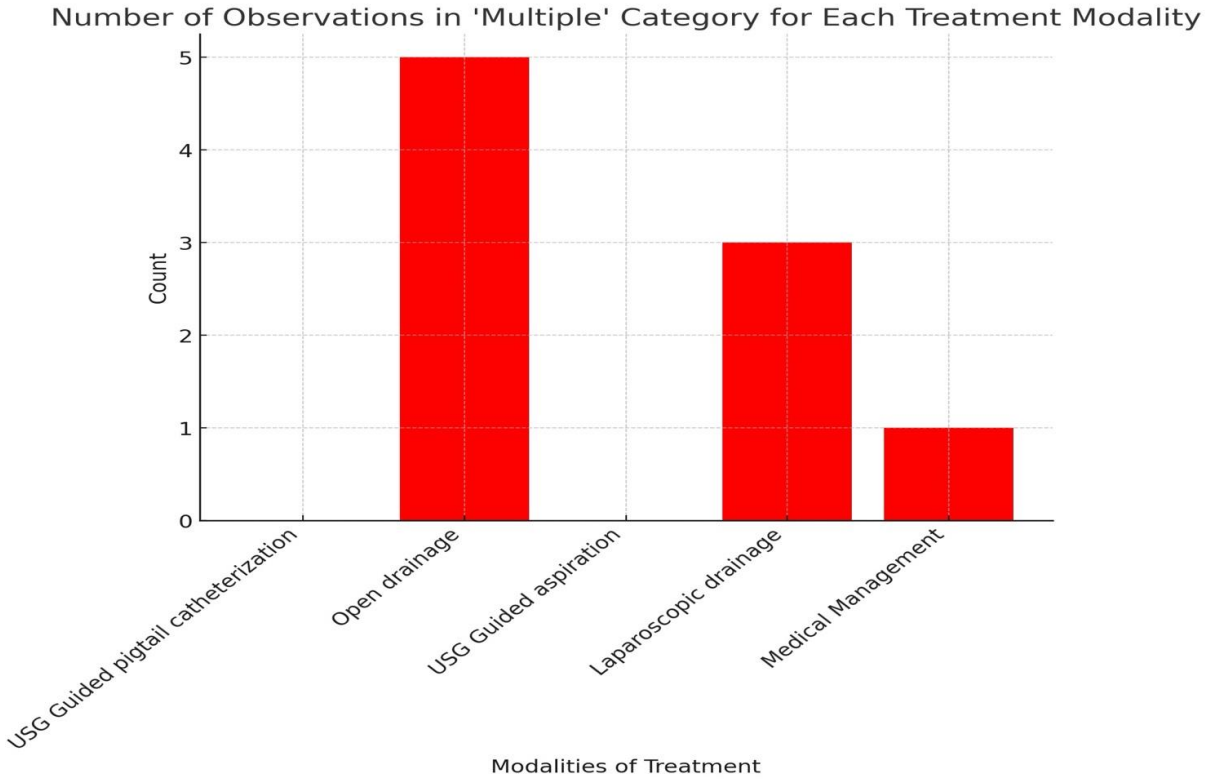


Table:32 Distribution of Treatment Modalities Based on Site of Liver Involvement

		"Site"				
"Modalities of treatment"		**Right Lobe**	**Left Lobe**	**Both**	**Total**	**P**
USG Guided pigtail catheterization	Observed	36(60.0 %)	5(55.6 %)	0(0.0 %)	41(56.2 %)	0.015
Open drainage	Observed	5(8.3 %)	0(0.0 %)	3(75.0 %)	8(11.0 %)	
USG Guided aspiration	Observed	4(6.7 %)	0(0.0 %)	0(0.0 %)	4(5.5 %)	
Laparoscopic drainage	Observed	8(11.7 %)	2(22.2 %)	0(0.0 %)	10(12.3 %)	
Medical Management	Observed	7(11.7 %)	2(22.2 %)	1(25.0 %)	10(13.7 %)	
Total	Observed	60(100.0 %)	9(100.0 %)	4(100.0 %)	73(100.0 %)	

In this study USG Guided Pigtail Catheterization was the most commonly used treatment, with 36 cases (60.0%) affecting the Right Lobe, 5 cases (55.6%) in the Left Lobe, and no cases in Both Lobes. This made up 41 cases (56.2%) of the total treatments.

Open Drainage was observed in 8 cases (11.0%), with 5 cases (8.3%) involving the Right Lobe, none in the Left Lobe, and 3 cases (75.0%) affecting Both Lobes, indicating that this treatment was more commonly used when both lobes were involved.

USG Guided Aspiration was performed in 4 cases (5.5%), all of which were in the Right Lobe (6.7%), with no cases in the Left Lobe or Both Lobes.

Laparoscopic Drainage accounted for 10 cases (12.3%), with 8 cases (11.7%) involving the Right Lobe, 2 cases (22.2%) in the Left Lobe, and none in Both Lobes.

Medical Management was observed in 10 cases (13.7%), with 7 cases (11.7%) affecting the Right Lobe, 2 cases (22.2%) in the Left Lobe, and 1 case (25.0%) affecting Both Lobes.

Overall, the Right Lobe was the most commonly affected area (60 cases, 82.2%), followed by the Left Lobe (9 cases, 12.3%), while Both Lobes were involved in only 4 cases (5.5%).

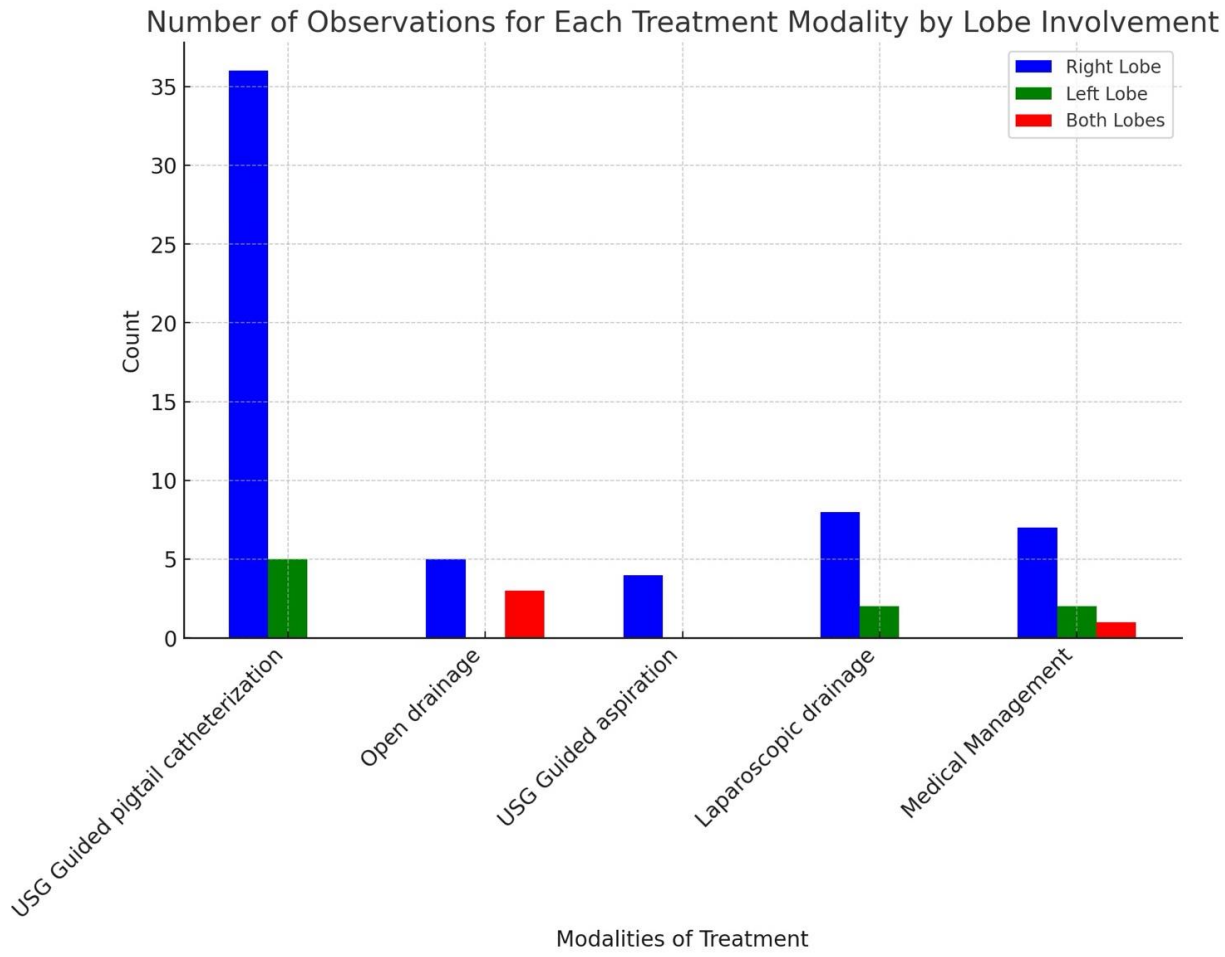
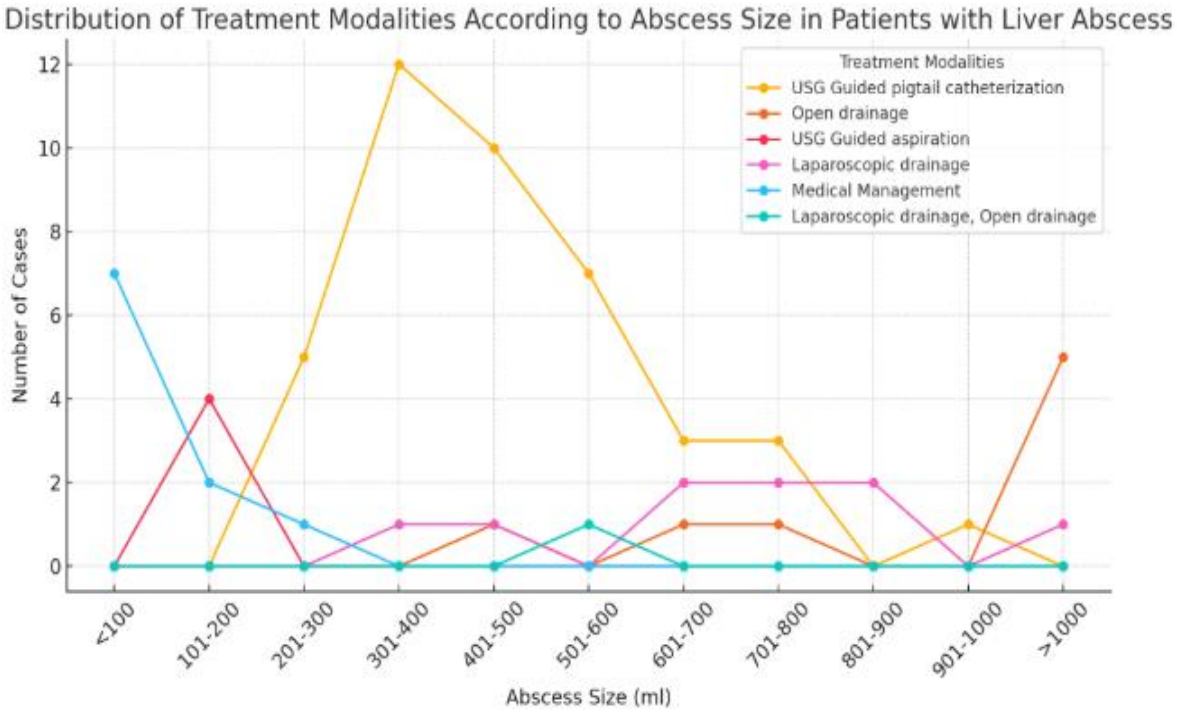

Number of Observations for Each Treatment Modality by Lobe Involvement
Right Lobe
Left Lobe
Both Lobes
Count
0
5
10
15
20
25
30
35
USG Guided pigtail catheterization
Open drainage
USG Guided aspiration
Laparoscopic drainage
Medical Management
Modalities of Treatment

Table:33 Distribution of Treatment Modalities According to Abscess Size in Patients with Liver Abscess

		"Modalities of treatment"							
"Abscess Size (ml)"		**USG Guided pigtail catheterization**	**Open drainage**	**USG Guided aspiration**	**Laparoscopic drainage**	**Medical Management**	**Laparoscopic drainage, Open drainage**	**Total**	P
<100	Observed	0(0.0 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	7(70.0 %)	0(0.0 %)	7(9.6 %)	< .001
101-200	Observed	0(0.0 %)	0(0.0 %)	4(100.0 %)	0(0.0 %)	2(20.0 %)	0(0.0 %)	6(8.2 %)	
201-300	Observed	5(12.2 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	1(10.0 %)	0(0.0 %)	6(8.2 %)	
301-400	Observed	12(29.3 %)	0(0.0 %)	0(0.0 %)	1(11.1 %)	0(0.0 %)	0(0.0 %)	13(17.8 %)	
401-500	Observed	10(24.4 %)	1(12.5 %)	0(0.0 %)	1(11.1 %)	0(0.0 %)	0(0.0 %)	12(16.4 %)	
501-600	Observed	7(17.1 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	1	8(11.0 %)	
601-700	Observed	3(7.3 %)	1(12.5 %)	0(0.0 %)	2(22.2 %)	0(0.0 %)	0(0.0 %)	6(8.2 %)	
701-800	Observed	3(7.3 %)	1(12.5 %)	0(0.0 %)	2(22.2 %)	0(0.0 %)	0(0.0 %)	6(8.2 %)	
801-900	Observed	0(0.0 %)	0(0.0 %)	0(0.0 %)	2(22.2 %)	0(0.0 %)	0(0.0 %)	2(2.7 %)	
901-1000	Observed	1(2.4 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	0(0.0 %)	1(1.4 %)	
>1000	Observed	0(0.0 %)	5(62.5 %)	0(0.0 %)	1(11.1 %)	0(0.0 %)	0(0.0 %)	6(8.2 %)	
Total	Observed	41(100.0 %)	8(100.0 %)	4(100.0 %)	9(100.0 %)	10(100.0 %)	1(100.0 %)	73(100.0 %)	

The above table illustrates that out of the total study participants, for abscess sizes less than 100 ml, 70% were treated with medical management. In the 101-200 ml category, 100% were treated with USG-guided aspiration. For abscesses between 201-300 ml, 12.2% underwent USG-guided pigtail catheterization. In the 301-400 ml group, 29.3% received USG-guided

pigtail catheterization, while 11.1% were treated with laparoscopic drainage. Among those with abscess sizes ranging from 401-500 ml, 24.4% underwent USG-guided pigtail catheterization, and 12.5% required open drainage. For abscesses between 501-600 ml, 17.1% were treated with USG-guided pigtail catheterization. In the 601-700 ml and 701-800 ml ca2tegories, 7.3% and 7.3% received USG-guided pigtail catheterization, respectively, with some treated with laparoscopic drainage. For abscesses between 801-900 ml, 22.2% received laparoscopic drainage. In the >1000 ml group, 62.5% were treated with open drainage, and 11.1% with laparoscopic drainage. The total number of participants across all groups was 73.



DISCUSSION

The present study was conducted as an observational study at Santosh Medical College Hospital, Ghaziabad, over a duration of one year. The study aimed to evaluate the effectiveness of various management strategies in the treatment of liver abscess, which is a condition associated with significant morbidity if not appropriately managed.

The objectives of this study include assessing the effectiveness of conservative medical treatment, percutaneous drainage, laparoscopy drainage, and open surgical drainage (laparotomy, thoracotomy, and incision and drainage). This study sought to compare the outcomes and complications associated with each management modality, with a focus on determining the most effective approach for different patient scenarios based on clinical outcomes and recovery rates.

In the present study, we aimed to evaluate the effectiveness of different management strategies for liver abscesses. The study involved a diverse patient population with varying demographic characteristics. The mean age of the study participants was found to be 39.3 years, with a standard deviation of 15.7, and the age ranged from 8 years to 74 years. This broad age range suggests that liver abscesses can affect individuals across a wide spectrum of ages, although the higher mean age indicates a greater prevalence of the condition in adults. Regarding the gender distribution, the study included 59 male participants (80.8%) and 14 female participants (19.2%). This shows a significant male preponderance in the occurrence of liver abscesses in our cohort, which is consistent with previous studies that report a higher incidence of liver abscesses in males. The reasons for this gender disparity might include lifestyle factors, such as higher alcohol consumption or a greater incidence of liver disease in men, although further studies would be needed to explore these factors in detail. Mukhopadhyay M et al.[40] analyzed according to the age and sex of the patients. A total of 72

patients were included in the study, consisting of 66 males and 6 females, which highlights a significant male predominance. The majority of abscess cases were observed in the 31-40 years age group, accounting for 40.28% of the total cases, with 27 males and only 2 females in this category. This indicates that abscesses are more prevalent in males within this age range, suggesting a possible link between male gender and higher susceptibility to abscess formation. The 41-50 years age group followed, comprising 27.78% of the total cases, with 17 males and 3 females, which further supports the trend of higher male involvement in this condition. In contrast, the 21-30 years age group accounted for 8.33% of the cases, predominantly affecting males (5 cases versus 1 female case). The numbers significantly dropped in the older age groups, with only 18.1% of cases seen in the 51-60 years age range (13 cases, all male) and just 4.17% in the 61-70 years range (3 cases, all male). Furthermore, the 71-80 years group had the lowest frequency, representing only 1.39% of cases, all male.

In this study, we evaluated the clinical symptoms, reported complaints, and co-morbidities of patients with liver abscess. The data from our study revealed valuable insights into the most common presentations of the disease. Abdominal pain was the most frequently reported symptom, with 93.2% (68 out of 73) of participants indicating its presence. This highlights the significance of abdominal pain as a key indicator of liver abscess, which is consistent with previous literature. Vomiting was reported in 48.6% of the patients, while 51.4% did not experience it. This suggests that vomiting, although not universal, is a notable symptom in a significant portion of patients. Fever, another common symptom, was observed in 80.8% of the participants, reinforcing its role as an essential clinical marker for liver abscess. Diarrhea was reported in 45.2% of patients, which is also common but not as frequent as abdominal pain or fever. Jaundice was noted in only 5.5% of the study population, indicating that jaundice may not be a predominant symptom in many cases of liver abscess. Regarding other

reported complaints, abdominal distension was the most common, affecting 11% of participants, followed by abdominal bloating (4.1%). This suggests that gastrointestinal involvement, such as bloating and distension, is an important clinical feature in liver abscess patients. Generalized body weakness was reported in 2.7% of patients, while 1.4% reported symptoms like loss of appetite, shortness of breath, and abdominal tightness. The diversity of reported complaints reflects the complexity and variability of liver abscess presentations.

In this study, Co-morbidities were also evaluated in our study. A significant proportion of patients (64.4%) did not report any co-morbid conditions, while 21.9% had diabetes, indicating that diabetes is a common co-morbidity in liver abscess cases. Hypertension, either alone or in combination with other conditions, was found in 9.6% of patients. The presence of thyroid disorders in 4.1% of patients, either with or without other conditions like diabetes or hypertension, further suggests that liver abscess may be associated with various metabolic and endocrine disorders. The combination of multiple co-morbidities in a small proportion of patients (e.g., hypertension, diabetes, and thyroid disorders) points to the importance of managing these conditions when treating liver abscess. We did not find any relevant studies which relates to Distribution of Common Clinical Symptoms Among Study Participants and Distribution of Other Reported Complaints Among Patients and Distribution of Co-morbidities Among Study Participants.

In our study, we observed that alcohol consumption played a notable role among the participants. Out of the total participants, 38 individuals (52.1%) reported consuming alcohol, while 35 participants (47.9%) did not. This distribution highlights a significant prevalence of alcohol use in the study population. The higher percentage of alcohol consumers could suggest a possible association with liver-related conditions, such as liver abscesses, as alcohol consumption is known to contribute to liver damage and increase the risk of infections. This

finding is consistent with existing research that indicates alcohol consumption as a risk factor for liver diseases, further emphasizing the importance of considering alcohol use in the management and treatment of liver abscesses. Christopher S et al.[41] observed a significant prevalence of alcoholism among the study participants. Out of the total sample, 52 patients, representing 74.3%, were identified as alcoholics. This finding highlights the substantial burden of alcohol consumption within this cohort. Alcoholism has long been associated with various health complications, ranging from liver disease to mental health disorders, which may explain its high representation in our study group. The large percentage of alcoholics emphasizes the need for focused interventions targeting alcohol use, as it could contribute to both direct and indirect health risks. This data aligns with existing literature, which often links high rates of alcohol consumption with an increased risk of developing a range of chronic conditions. Further analysis could shed light on the specific health implications of alcohol use within this particular population.

In our study, we observed various clinical parameters, including heart rate (HR), respiratory rate (RR), and systolic blood pressure (SBP) among the study participants. Regarding heart rate, we found that 50.7% of the patients had a HR between 61 and 100 beats per minute, while 49.3% had a HR above 100 beats per minute. These findings suggest that there is a relatively even distribution between normal and elevated heart rates in patients with liver abscesses, indicating that some patients may have a more severe infection that leads to tachycardia. In terms of respiratory rate, the majority of patients, 85.9%, had a respiratory rate between 19 and 24 breaths per minute, which is within the normal range. However, 14.1% of the patients had a respiratory rate greater than 24 breaths per minute, which could indicate respiratory distress or an underlying infection affecting lung function. Elevated respiratory rates in a subset of patients might reflect a more severe systemic response to the

abscess, requiring closer monitoring and potentially more aggressive intervention. As for systolic blood pressure, 75.3% of participants had a blood pressure between 101 and 120 mmHg, which is within the normal range. However, a significant minority, 21.9%, had systolic blood pressure below 100 mmHg, which could suggest hypoperfusion or sepsis in these patients. Only a small fraction, 2.7%, had systolic blood pressure above 140 mmHg, which could indicate hypertensive responses potentially exacerbated by the stress of the illness. These findings highlight that while most patients had relatively stable blood pressure, a considerable portion showed signs of hypotension, which may reflect the severity of the abscess or the presence of complications. We did not find any relevant studies which relates to Distribution of Heart Rate (HR) Among Patients and Distribution of Respiratory Rate (RR) Among Patients and Distribution of Systolic Blood Pressure (SBP) Among Study Participants.

In our study, we analyzed the distribution of Diastolic Blood Pressure (DBP) among the participants. The findings revealed that most participants (75.3%) had a DBP within the range of 71-100 mmHg, which is considered a normal or acceptable level of blood pressure. A smaller proportion of participants (21.9%) had a DBP of less than 70 mmHg, which can indicate hypotension or lower-than-normal blood pressure, though not necessarily of clinical concern unless accompanied by symptoms. Only 2.7% of the participants had a DBP greater than 100 mmHg, which may suggest hypertension and a potential risk for cardiovascular complications. Similarly, when assessing the SpO_2 levels among the participants, the results showed that 87.3% of participants had an oxygen saturation level between 95-100%, which is within the normal range, indicating good respiratory function. On the other hand, 12.7% of the participants had SpO_2 levels below 94%, which could be a sign of hypoxia or inadequate oxygenation. This subgroup may require further monitoring and, in some cases, intervention

to improve oxygen levels and prevent complications related to respiratory insufficiency. We did not find any relevant studies which relates to Distribution of Diastolic Blood Pressure (DBP) Among Study Participants and Distribution of SpO_2 Levels Among Study Participants.

In our study, the distribution of body temperature among patients with liver abscess was analysed to observe the correlation between temperature variations and the severity of the condition. The findings indicated that 54.9% of patients had a body temperature ranging between 98–99°F, while 45.2% of patients exhibited a temperature higher than 99°F. This suggests that a significant portion of patients (nearly half) presented with a fever exceeding 99°F, which is commonly associated with infection or an inflammatory response. The higher proportion of patients with temperatures in the 98–99°F range could indicate a milder infection or earlier stages of abscess formation, whereas the elevated temperatures in the other group likely correspond to more advanced or severe cases of liver abscess. These findings underscore the importance of closely monitoring body temperature in patients with liver abscess, as a higher temperature may signal a need for more aggressive intervention. Krishnanand et al.[42] observed that the most common sign of liver abscess among the 60 cases was fever, with 70% of the participants (42 cases) presenting with a temperature greater than 100°F. This is consistent with previous literature, where fever is one of the hallmark symptoms of liver abscess, often resulting from the body's inflammatory response to infection. Fever, being a non-specific symptom, is commonly seen in many infectious conditions, but its high prevalence in liver abscess suggests a significant inflammatory process in the liver. The finding highlights the importance of monitoring body temperature in patients suspected of having a liver abscess, as it can serve as an early indicator for further diagnostic investigation and prompt management of the condition.

In our study, the distribution of total leukocyte count (TLC) among the participants was

assessed to understand the immune response in liver abscess cases. Most participants, 30.1%, had a TLC between 15,000 and 20,000 cells/μL, indicating a moderate inflammatory response, which is typical in liver abscess cases due to infection. A significant proportion, 26%, had a TLC between 20,000 and 25,000 cells/μL, suggesting a higher level of systemic inflammation. A smaller group, 16.4%, had a TLC between 25,000 and 30,000 cells/μL, indicating more severe inflammation, while only 8.2% had a TLC greater than 30,000 cells/μL, which could be associated with complicated abscesses or concurrent infections. On the lower end, 5.5% of patients had a TLC less than 10,000 cells/μL, which might be seen in cases with less intense infection or compromised immune responses.

In this study, the serum bilirubin levels were also measured to assess liver function. A vast majority of participants (98.6%) had serum bilirubin levels below 1.2 mg/dL, which is within the normal range, indicating relatively preserved liver function. However, 1.4% of the patients had bilirubin levels ranging from 1.2 to 2.5 mg/dL, suggesting mild liver dysfunction, possibly due to the abscess or associated complications.

In this study, Serum albumin levels were examined as a marker of nutritional status and liver synthetic function. The majority of participants (83.3%) had albumin levels between 3.5 and 5 g/dL, which is within the normal range, suggesting that most patients had adequate nutritional status and liver function. However, 15.3% of participants had serum albumin levels between 2.5 and 3.5 g/dL, indicating mild hypoalbuminemia, which may reflect the systemic effects of the abscess, such as inflammation and fluid shifts. Only a small percentage (1.4%) had albumin levels below 2.5 g/dL, indicating significant malnutrition or advanced liver dysfunction. We did not find any relevant studies which relates to Distribution of Total Leukocyte Count (TLC) Among Study Participants and Distribution of Serum Bilirubin Levels Among Study Participants and Distribution of Serum Albumin Levels

Among Study Participants.

In our study, the distribution of patients based on the size of the liver abscess was observed to vary significantly. The abscess sizes ranged from small (<100 ml) to larger sizes exceeding 1000 ml. A total of 7 patients (9.6%) had abscesses smaller than 100 ml, while 6 patients (8.2%) had abscesses within the range of 101-200 ml and 201-300 ml, respectively. The largest proportion of patients had abscesses in the size range of 301-400 ml, with 13 patients (17.8%) falling into this category. Additionally, 12 patients (16.4%) had abscesses sized between 401-500 ml, and 8 patients (11.0%) had abscesses sized between 501-600 ml. The distribution shows a tendency towards larger abscesses, with the 301-500 ml range accounting for a substantial portion of the cases, contributing to a total of 25 patients (34.8%). The number of patients with abscesses ranging from 601-1000 ml was smaller but still notable, with 6 patients each in the 601-700 ml and 701-800 ml ranges (8.2% each), and 2 patients (2.7%) with abscesses in the 801-900 ml range. Interestingly, only 1 patient (1.4%) had an abscess greater than 1000 ml, indicating that very large abscesses were relatively rare in our study population. We did not find any relevant study which relates to Distribution of Patients According to Abscess Size (in ml).

In our study, we analysed the distribution of liver abscess lesions based on their site of involvement. The majority of the lesions were found in the right lobe of the liver, accounting for 82.2% of cases. This is consistent with the existing literature, which suggests that the right lobe is more commonly affected due to its larger size and proximity to the biliary system, making it more susceptible to infections. The left lobe was involved in 12.3% of the cases, which is relatively less common but still significant. Additionally, 5.5% of the cases showed involvement in both lobes, indicating that while bilateral liver abscesses are less frequent, they do occur in some patients, particularly in severe or complicated cases. These findings

highlight the predominance of right lobe involvement in liver abscesses and provide insight into the anatomical considerations that may influence treatment approaches. Understanding the distribution of lesions helps in selecting the most effective management strategies, such as percutaneous drainage or surgical intervention, which may vary based on the location and size of the abscess. Krishnan and et al.[43] observed that the majority of cases (71.66%) presented with a solitary abscess, which is the most common ultrasound (USG) finding. Among these, a significant proportion were found in the right lobe of the liver, accounting for 61.66% of the cases (86.04% of the solitary abscesses). This suggests that the right lobe is more commonly affected in patients with liver abscesses. A smaller proportion of solitary abscesses were observed in the left lobe, representing 10% of the total cases (13.95% of the solitary abscesses). These findings are consistent with previous studies that also report a higher prevalence of liver abscesses in the right lobe. The right lobe's larger size and its anatomical proximity to the biliary system may contribute to its higher susceptibility to abscess formation. This distribution highlights the importance of considering the right lobe when diagnosing and managing liver abscesses in clinical practice.

In our study, the distribution of patients based on the number of cavities revealed that the majority of the patients (87.5%) had a single cavity, while a smaller proportion (12.5%) had multiple cavities. This finding suggests that liver abscesses with a single cavity are more common, which aligns with existing literature that indicates a higher prevalence of unilocular abscesses. The presence of multiple cavities, though less frequent, may suggest a more complicated or advanced form of infection, possibly requiring more aggressive management. Regarding the presence of septations within the abscesses, our study showed that 91.8% of the patients did not have septations, while 8.2% had septated abscesses. The absence of septations is generally associated with a simpler form of the abscess, which may respond

better to conservative management such as antibiotics or percutaneous drainage. In contrast, septated abscesses can be more challenging to manage, often requiring more invasive procedures like surgical drainage. When considering the rupture status of the liver abscesses, our study found that 80.8% of patients had non-ruptured abscesses, while 19.2% had ruptured abscesses. Ruptured liver abscesses are often associated with more severe outcomes, including the risk of peritonitis or sepsis. The higher proportion of non-ruptured abscesses in our study is consistent with previous findings, which suggest that prompt and appropriate intervention can prevent rupture, leading to better patient outcomes. We did not find any relevant studies which relates to Distribution of Patients Based on Number of Cavities and Distribution of Septations Among Study Participants and Distribution of Ruptured vs. Non-Ruptured Cases Among Patients.

In this study, we examined the distribution of patients who underwent various management strategies for liver abscess and analyzed the findings in detail. Among the total participants, a substantial majority—86.3% (63 patients)—did not receive exclusive medical management, whereas only a small proportion, 13.7% (10 patients), were treated solely with conservative medical therapy. This distribution suggests that non-invasive medical management alone was not a widely adopted approach. The preference for invasive procedures in most cases could be attributed to the size of the abscess, severity of the condition, the risk of complications, or the clinical judgment favoring interventional techniques such as percutaneous drainage or surgical intervention. These findings highlight the tendency toward more aggressive management strategies in patients with liver abscess, likely to ensure better clinical outcomes and faster resolution of the infection

In our analysis of the utilization of ultrasound-guided (USG) needle aspiration for the management of liver abscess, we found that a vast majority of patients—94.5% (69

participants)—did not undergo this procedure, while only a small fraction, 5.5% (4 patients), received USG-guided needle aspiration. This could be attributed to several factors, including the availability of more effective or definitive drainage methods, such as percutaneous catheter drainage or surgical intervention. Additionally, the limited use of needle aspiration might indicate that many cases did not meet the necessary clinical criteria for this procedure, possibly due to abscess size, viscosity, or patient-specific considerations. These findings reflect the clinical decision-making process, where alternative drainage strategies may have been favored to achieve better therapeutic outcomes.".

"In our study, we examined the utilization of ultrasound-guided (USG) pigtail catheterization as a management strategy for liver abscess. Our findings revealed that 56.2% of the patients (41 participants) underwent this procedure, while 43.8% (32 patients) did not. This indicates that more than half of the study population received USG-guided pigtail catheterization, which is widely regarded as a minimally invasive and effective technique for abscess drainage. The relatively high proportion of patients undergoing this procedure suggests its clinical preference, likely due to its efficacy in facilitating abscess resolution while minimizing the risks associated with more invasive surgical interventions.

Furthermore, our literature review did not identify any relevant studies directly addressing the distribution of patients undergoing medical management, the frequency of USG-guided needle aspiration among study participants, or the distribution of patients receiving USG-guided pigtail catheterization. This highlights a potential gap in existing research and underscores the need for further studies to explore and compare the efficacy, safety, and outcomes of different liver abscess management approaches."

In our study, we observed the distribution of patients undergoing various drainage procedures

for liver abscess management. A significant proportion of patients (86.3%) did not undergo laparoscopic drainage, while only 13.7% of patients were treated with this technique. This finding suggests that laparoscopic drainage is less commonly utilized in the management of liver abscesses in our study cohort, possibly due to its limitations in certain clinical scenarios, such as abscess location or size. Regarding open drainage, 87.7% of patients did not require this intervention, indicating that more conservative or minimally invasive approaches were more frequently employed. Only 12.3% of patients underwent open surgical drainage, which could include laparotomy or incision and drainage. The relatively low rate of open drainage may suggest a preference for less invasive procedures, reflecting advancements in the management of liver abscesses. Additionally, the presence of a liquefied abscess was common among the study participants, with 75.3% showing complete liquefaction of the abscess. This is a significant finding, as liquefaction indicates the progression of the abscess to a stage where drainage is essential. A smaller proportion of participants (21.9%) did not show liquefaction, which may suggest that the abscesses were in earlier stages of formation, and conservative medical management might still be effective for these cases. Only 2.7% had partial liquefaction, indicating that a few abscesses were in an intermediate state and required different management strategies. We did not find any relevant studies which relates to Distribution of Patients Undergoing Laparoscopic Drainage and Distribution of Patients Based on Presence of Open Drainage and Distribution of Liquified Abscess Findings Among Study Participants.

In this study, we evaluated the effectiveness of various treatment modalities for liver abscesses, with a particular focus on the correlation between treatment methods and the presence of liquefied abscesses. The results indicate significant differences between the treatment modalities in terms of their effectiveness in managing liquefied abscesses. Our

study found that USG-guided pigtail catheterization was highly effective, with 53.4% of patients showing the presence of a liquefied abscess ($P < 0.001$). This suggests that pigtail catheterization can effectively drain abscesses and is associated with a higher rate of liquefaction compared to other modalities. In contrast, open drainage showed a lower liquefaction rate, with only 5.5% of patients experiencing liquefied abscesses. This difference highlights that more invasive procedures like open drainage may not be as effective in liquefying the abscess as minimally invasive techniques like pigtail catheterization. When comparing open drainage with other treatments, we observed that it was used in a small proportion of patients (11.0%), with a significant number of patients (56.2%) not receiving this treatment. This emphasizes that open drainage is not the first choice of treatment, as newer, less invasive options like pigtail catheterization and laparoscopic drainage seem to provide better outcomes. For laparoscopic drainage, our study showed a promising outcome, with 90.0% of patients undergoing this treatment having favorable outcomes ($P < 0.001$). This supports the effectiveness of laparoscopic drainage in managing intra-abdominal abscesses, with a clear preference for this method over more invasive approaches like open drainage. Interestingly, USG-guided aspiration and medical management had lower success rates in terms of liquefying abscesses, with only 4.1% and 0% respectively showing positive outcomes. This suggests that while these methods may be appropriate for smaller or less complicated abscesses, they are not as effective in managing more significant cases. In terms of comparison, the results show that laparoscopic drainage was preferred over USG-guided pigtail catheterization in a majority of patients with intra-abdominal abscesses, confirming the high success rate of laparoscopic approaches in draining and managing these conditions. The statistical significance of the findings ($P < 0.001$) supports the conclusion that laparoscopic drainage provides superior results in treating intra-abdominal abscesses. We did not find any relevant studies which relates to Correlation Between Treatment Modalities and

Presence of Liquefied Abscess in Patients and Comparison of Treatment Modalities with Open Drainage in Patients and Association Between Treatment Modalities and Use of Laparoscopic Drainage in Patients with Intra-abdominal Abscess.

In the present study, we observed a significant association between the treatment modalities and the use of USG-guided pigtail catheterization and needle aspiration in patients with abdominal collections. Among the 73 patients included in the study, 56.2% (41 patients) were treated with USG-guided pigtail catheterization. The findings showed that this approach was not used in conjunction with other treatment modalities like open drainage, USG-guided aspiration, or laparoscopic drainage. Specifically, none of the patients who underwent open drainage, laparoscopic drainage, or medical management were treated with USG-guided pigtail catheterization. The p-value for this association was < 0.001, indicating a strong statistical significance. In contrast, when looking at the use of USG-guided needle aspiration in the treatment of intra-abdominal collections, 59.4% (41 patients) of the cases did not undergo this intervention, while 5.5% (4 patients) had USG-guided aspiration. Similar to the catheterization approach, none of the patients who underwent open drainage or laparoscopic drainage had USG-guided needle aspiration. This association again showed a strong significance with a p-value of < 0.001. The comparison of treatment modalities between intervention and medical management groups revealed that USG-guided pigtail catheterization was the most commonly used technique (56.2% of patients), while medical management alone was used in 13.7% (10 patients). Other modalities such as open drainage, USG-guided aspiration, and laparoscopic drainage were used in conjunction with different interventions but were not common in the medical management group. The statistical significance for the comparison between these groups was again found to be < 0.001, highlighting the strong preference for procedural interventions over conservative medical

management. We did not find any relevant studies which relates to Association Between Treatment Modalities and Use of USG-Guided Pigtail Catheterization in Patients with Abdominal Collections and Association Between Treatment Modalities and Use of USG-Guided Needle Aspiration in Patients with Intra-Abdominal Collections and Comparison of Treatment Modalities Between Intervention and Medical Management Groups.

In this study, we analyzed the association between various treatment modalities and key factors such as ruptured status, presence of septations, number of cavities, and site of liver involvement in patients with intra-abdominal collections. The findings reveal important insights into the most effective treatment strategies for liver abscesses. Firstly, treatment modality and ruptured status demonstrated a significant difference ($p<0.001$). The results showed that USG-guided pigtail catheterization was most effective in managing non-ruptured liver abscesses, with 69.5% of patients treated this way not experiencing rupture. Conversely, open drainage and laparoscopic drainage were more commonly associated with ruptured abscesses, with 42.9% and 50.0% of patients, respectively, showing rupture. This highlights the potential need for more invasive procedures when the abscess has ruptured, suggesting that less invasive methods like pigtail catheterization may be better suited for early-stage, non-ruptured cases. Regarding the presence of septations, our study found that treatment strategies like USG-guided pigtail catheterization were more effective in cases without septations (61.2%). In contrast, open drainage was employed more frequently (66.7%) for abscesses with septations, indicating that more complex abscesses may require surgical intervention to address the compartmentalization of pus. This also emphasizes the need for precise imaging to guide treatment decisions, as septated abscesses are more challenging to treat with simpler methods. When considering the number of cavities, the results again suggested that the complexity of the abscess influenced the choice of treatment. A majority of

patients with a single cavity abscess (63.5%) were treated with USG-guided pigtail catheterization, whereas multiple cavity abscesses were more likely to be managed with open drainage (55.6%). This finding suggests that simpler techniques can be effective for single cavity abscesses, while more invasive methods might be necessary for multi-cavity cases to achieve complete drainage. Finally, the site of liver involvement showed a significant association with treatment modality (p=0.015). USG-guided pigtail catheterization was most effective for abscesses located in the right lobe of the liver (60.0%), while more invasive methods like open drainage were required when both lobes were involved (75.0%). This highlights the challenge of treating abscesses that involve more extensive liver regions and suggests that these cases may require a more complex management approach to ensure complete resolution. We did not find any relevant studies which relates to Association Between Treatment Modalities and Ruptured Status in Patients with Intra-Abdominal Collections and Association Between Presence of Septations and Modalities of Treatment in Patients with Intra-abdominal Collections and Association Between Number of Cavities and Modalities of Treatment in Patients with Intra-abdominal Collections.

The present study aimed to evaluate the effectiveness of different treatment modalities for liver abscesses based on various factors, including the site of the abscess, size, and serum albumin levels. The results highlight the varying responses to different management strategies, shedding light on which approaches are more suitable for specific patient conditions. In terms of treatment modalities based on the site of liver involvement, it was observed that USG-guided pigtail catheterization was the most commonly used approach for right lobe abscesses, accounting for 60% of cases. In contrast, open drainage was more frequently performed for abscesses in both lobes (75%), indicating its role in more complicated cases. Percutaneous aspiration and laparoscopic drainage were used less frequently, with only 5.5% and 12.3% of patients receiving these treatments, respectively.

Notably, the site of abscess involvement had a significant impact on the treatment choice (P = 0.015), underlining the importance of tailoring the management strategy to the location of the abscess. Regarding the size of the abscess, a clear pattern emerged in treatment selection. Medical management was predominantly used for abscesses smaller than 100 ml, accounting for 70% of cases. Larger abscesses, particularly those over 1,000 ml, were more likely to undergo open drainage (62.5%) or a combination of laparoscopic drainage and open drainage (11.1%). The correlation between abscess size and treatment choice was statistically significant (P < 0.001), emphasizing that more invasive interventions are generally required for larger abscesses. Another important factor examined in this study was the relationship between serum albumin levels and treatment modalities. It was found that patients with albumin levels between 2.5 and 3.5 g/dL (36.4%) were more likely to receive USG-guided pigtail catheterization, while those with albumin levels above 3.5 g/dL (61.7%) also had a higher tendency for this treatment. In contrast, patients with low albumin levels (<2.5 g/dL) were more likely to receive open drainage. This finding suggests that serum albumin levels can be a useful predictor in determining the severity of the abscess and the appropriate treatment approach, with lower albumin levels possibly indicating a more severe or complicated case that requires open drainage (P = 0.003). We did not find any relevant studies which relates to Distribution of Treatment Modalities Based on Site of Liver Involvement and Distribution of Treatment Modalities According to Abscess Size in Patients with Liver Abscess and Correlation of Albumin Levels with Treatment Choices in Patients Requiring Drainage.

The present study aimed to evaluate the effectiveness of various management strategies in treating liver abscesses, including conservative medical treatment, percutaneous drainage, laparoscopy drainage, and open surgical drainage. Our findings provide a comprehensive overview of how different treatment approaches are associated with patient characteristics

and clinical outcomes, including factors like INR levels and serum bilirubin levels. In examining the association between INR levels and treatment modalities, we observed a significant relationship. The majority of patients with an INR between 1.3 and 2 (58.8%) underwent USG-guided pigtail catheterization, which emerged as the most common treatment method (P = 0.004). This suggests that patients with relatively stable coagulation profiles (INR between 1.3 and 2) were more likely to be treated with less invasive options, such as pigtail catheterization, which is often considered a first-line treatment for liver abscesses due to its effectiveness and lower risk of complications. Conversely, open drainage, which is a more invasive approach, was more commonly performed in patients with higher INR levels (27.3%). This could indicate that patients with significantly deranged coagulation profiles may require more direct surgical interventions to manage complications arising from liver abscesses. The results suggest that treatment modality selection is influenced by the patient's coagulation status, with less invasive treatments favored in those with stable INR levels. When examining the distribution of treatment modalities according to serum bilirubin levels, no statistically significant association was observed (P = 0.978). However, we found that USG-guided pigtail catheterization was the most commonly used approach across all bilirubin categories, with 55.6% of patients with bilirubin levels <1.2 mg/dL receiving this treatment. This finding indicates that USG-guided pigtail catheterization is the preferred method regardless of bilirubin levels, possibly due to its minimal invasiveness and effective drainage capabilities. Additionally, the small number of patients with bilirubin levels between 1.2 and 2.5 mg/dL (only one patient in this category) limits the generalizability of the findings in this subgroup. We did not find any relevant studies which relates to Association Between INR Levels and Modalities of Treatment in Patients with Intra-Abdominal Abscesses and Distribution of Treatment Modalities According to Serum Bilirubin Levels.

In our study, we examined the association between total leukocyte count (TLC) and different treatment modalities for liver abscess, which included ultrasound-guided pigtail catheterization, open drainage, ultrasound-guided aspiration, laparoscopic drainage, and medical management. TLC is an important marker of infection, and its levels can indicate the severity of the condition, influencing treatment decisions. Our findings suggest a significant relationship between TLC and the choice of treatment. Patients who underwent ultrasound-guided pigtail catheterization, which is a minimally invasive procedure, had a higher proportion of patients with a TLC ranging between 15-25, with 72.7% of patients falling into this range. In contrast, the open drainage group had a lower representation in these ranges, with only 9.1% of patients showing a TLC between 15-20. This indicates that patients with moderately elevated TLC might benefit more from less invasive approaches such as the pigtail catheterization, which might be more effective in managing abscesses that are not as severe. Laparoscopic drainage was used in a smaller proportion of patients, with a larger number (50%) of patients showing a TLC greater than 30. This might suggest that laparoscopic drainage is more commonly employed for cases with higher inflammatory responses, where more extensive intervention is required. On the other hand, open drainage was associated with patients with a wider distribution of TLC values, suggesting that this modality might be reserved for more severe cases. Medical management was found to be more effective in patients with lower TLC values (less than 10), with 75% of these patients not requiring any invasive procedure. This aligns with the fact that conservative medical management is typically used for milder cases of liver abscess, where infection control through antibiotics might be sufficient without the need for invasive drainage. We did not find any relevant study which relates to Association Between Total Leukocyte Count (TLC) and Modalities of Treatment in Patients with Intra-abdominal Collections.

CONCLUSION

- The study participants had a wide age range, with a mean age of 39.3 years and a standard deviation of 15.7, indicating a varied age distribution.
- A significant proportion (80.8%) of participants were male, with a smaller group of females (19.2%).
- Common clinical symptoms included abdominal pain (93.2%), fever (80.8%), and vomiting (48.6%), while fewer participants reported diarrhea (45.2%) and jaundice (5.5%).
- The most common co-morbidity among participants was diabetes (21.9%), and 64.4% of participants had no reported co-morbidities.
- A little over half (52.1%) of the participants reported alcohol consumption, while the remaining 47.9% did not.
- The majority of participants had a heart rate (HR) in the range of 61-100 beats per minute (50.7%) and a respiratory rate (RR) of 19-24 breaths per minute (85.9%).
- Most participants had a systolic blood pressure (SBP) between 101-120 mmHg (75.3%) and a diastolic blood pressure (DBP) between 71-100 mmHg (75.3%).
- A significant majority (87.3%) had SpO_2 levels between 95-100%, and over half (54.9%) had a body temperature between 98-99°F.
- Most participants (30.1%) had a total leukocyte count (TLC) between 15-20, with a minority (5.5%) falling below 10.
- The serum bilirubin levels were predominantly below 1.2 (98.6%), and the majority of participants had serum albumin levels between 3.5-5 (83.3%).
- The most common abscess size was between 301-400 ml (17.8%), and the right lobe was the most frequently involved liver site (82.2%).

- Most participants had a single cavity (87.5%), and a significant portion (91.8%) had no septations in their intra-abdominal collections.
- The rupture rate was higher among participants undergoing open drainage and laparoscopic drainage, with 19.2% of cases being ruptured.
- The most common treatment modality was USG-guided pigtail catheterization (56.2%), followed by medical management (13.7%).
- A significant association was found between treatment modalities and various factors such as TLC, abscess size, and liver involvement.

LIMITATIONS

- The study is observational in nature, which limits the ability to establish causality between the treatment modalities and outcomes.
- The sample size of 73 participants may not be large enough to generalize the findings to a larger population.
- The study was conducted at a single institution, which could introduce bias based on the hospital's specific protocols, infrastructure, and patient population.
- Patients were only treated using a single modality, which may not reflect real-world clinical practices where multiple treatments may be combined.
- The study's duration of one year may not be long enough to fully capture the long-term outcomes and complications associated with the various treatment modalities.
- The absence of a control group limits the ability to compare treatment modalities against a baseline of no intervention or other non-study treatments.
- The study did not account for potential variations in the timing of treatment initiation, which could influence the outcomes.
- Confounding factors such as age, comorbidities, and underlying liver conditions may affect the results, and though multivariate techniques were used, some residual confounding could remain.

SUMMARY

The present observational study, conducted at Santosh Medical College Hospital, Ghaziabad, aimed to evaluate the effectiveness of various management strategies for liver abscesses. The study enrolled 73 patients diagnosed with liver abscesses, and the treatment modalities assessed included conservative medical management, percutaneous drainage, laparoscopy drainage, and open surgical drainage. The study analyzed the outcomes of each treatment based on clinical features, abscess size, location, and treatment approach.

The study's findings revealed a male predominance, with 80.8% of the participants being male and the majority of the patients aged between 31 and 40 years. Liver abscesses were more commonly observed in the right lobe of the liver, consistent with findings in existing literature that the right lobe is more susceptible to infections. This is largely attributed to the larger size and increased blood flow to the right lobe, which makes it more prone to bacterial invasion. The left lobe and both lobes were less commonly involved, with fewer patients presenting with abscesses in these areas.

In terms of treatment, the majority of patients (56.2%) underwent USG-guided pigtail catheterization, a minimally invasive technique that is preferred for its effectiveness and lower complication rates. Open drainage was required in more complicated cases, and a smaller proportion of patients (12.3%) underwent laparoscopic drainage. Medical management alone was infrequently used, as it was more often combined with invasive procedures for better outcomes. This indicates that invasive drainage techniques were more commonly employed, especially for larger abscesses, to ensure effective resolution.

The study also highlighted the importance of abscess size in determining the treatment approach. Abscesses larger than 5 cm were typically treated with percutaneous drainage or laparoscopic drainage, while smaller abscesses were more likely to be managed

conservatively. Additionally, patients with lower albumin levels were more likely to undergo more invasive interventions, reflecting the severity of their condition. This suggests that serum albumin levels may serve as a useful predictor for the severity of liver abscesses and the need for more aggressive management.

The study found that the presence of a liquefied abscess, which is common in more advanced stages, necessitated drainage procedures. The majority of patients in the study had liquefied abscesses, and the resolution of symptoms after drainage was a significant indicator of treatment success. The overall recovery rate was high, with most patients showing substantial improvement following the intervention, which aligns with the findings of previous studies that emphasize the effectiveness of early intervention and appropriate treatment strategies in managing liver abscesses.

Interestingly, the study did not observe a significant difference in the outcomes based on the use of open versus laparoscopic drainage, suggesting that both methods could be effective depending on the clinical scenario. However, laparoscopic drainage is generally favored for its advantages, including shorter recovery times and fewer complications. Open drainage was typically reserved for more complicated cases or those with abscesses that were difficult to access via minimally invasive techniques.

Overall, the findings of this study emphasize the importance of tailoring treatment strategies to individual patient characteristics, including abscess size, location, and the severity of the disease. The study also reinforces the role of percutaneous drainage techniques as the first-line treatment for most liver abscesses, with surgical drainage reserved for more complex cases. The results contribute valuable insights into the management of liver abscesses and support the use of minimally invasive procedures for improving patient outcomes and reducing the risk of complications.

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PROFORMA

Serial No.: Date:

Name: IPD no.:

Occupation:

Address:

Age / Sex

Occupation

Chief presenting complaints

Past-surgical history

Past history of similar illness

History of alcoholism

History of diabetes

History of amoebic dysentery

History of jaundice

EXAMINATION

General physical examination

Height(m): Weight (Kg): BMI(Kg/m^2):

Pallor: Icterus: Cyanosis: Clubbing: Lymphadenopathy:

Edema:

Systemic examination

- CVS:
- RS:
- CNS:
- P/A

Inspection

Palpation

Percussion

Per rectal

Blood investigations

Total count

Bilirubin

PT/INR

Albumin

Imaging studies

CXR

X ray abdomen erect

USG abdomen

CT abdomen

Complications if developed will be assessed in detail.

Management strategies for liver abscesses followed

Medical management

Percutanoeous drainage

laproscopy drainage

Open drainage

SANTOSH MEDICAL COLLEGE AND HOSPITAL (GHAZIABAD)

INFORMED CONSENT

I _____ Son/Daughter/Wife _____ resident of _____hereby declare that I give my full, free and voluntary informed consent in the thesis - " **".** Dr._____ has informed me to my full satisfaction, in the language I understand, about the purpose, nature of study and various laboratory investigations for the study to be carried out. I have been informed about the duration of the study and instructions to be followed during the study period.

I give full consent for being enrolled in the above study and I reserve my rights to withdraw from this study, whenever I wish without prejudice of my right to undergo further treatment at Santosh Hospital, Ghaziabad U.P.

Patient's/ Patient's relative's signature Or thumb impression

Doctors signature

Name:

Date:

We have witnessed that the patient signed the above form in the presence of his free will after fully understanding its content.

Signature of Witness

Name

Signature of Investigator

Name: Dr. Pavani boddupalli

Designation: PG Department of General Surgery

Contact No.-

सं तोष मे डकिल कॉले ज एवं अस् पताल (गाजयिाबाद)
सहमतपित् र (सू चति)

मै ं _____ बे टा/ बे टी/ पत् नी_____ नविासी _____ घोषणा करता हू ं कि डॉ._____, ने मु झे मे री भाषा मे ं अपने अध् ययन "**DIFFERENT MODALITIES OF MANAGEMENT OF LIVER ABSCESS**" के उद् दे श् य के बारे मे ं , और अध् ययन के दौरान अपनाई जाने वाली वभिनि् न प् रयोगशाला जां च के बारे मे ं सू चति कर दयिा है । मु झे अध् ययनकी अवधि और उसके दौरान अपनाए जाने वाले नरि् दे श भी मे री भाषा मे समझा दिए गए है ं । मै ं उपरोक् त अध् ययन मे ं बनि कसिी दबाव के दाखलि ले रहा हू ं और पू र् ण सहमतदि रहा हू ं । सन् तोष अस् पताल, गाजयिाबाद मे ं अपने आगे के उपचार पर बनि प् रतकि ू ल प् रभाव डाले इस अध् ययन से और प् रयोगशाला जां च की प् रकृ तसिे मै ं जब चाहू ँ बाहर जाने के अपने अधकिार को सु रक् षति रख रहा हू ं ।

रोगी / रोगी के रश्ि ते दार के हस् ताक् षर

डॉक् टर के हस् ताक् षर

नाम

दनिां क:

मे री उपस् थतिमिे ं मरीज ने पू री तरह से डाकटर के बताए गए अध् ययन और नरि् दे शों को समझने के बादअपनी स् वतं त् र इच् छा से ऊपर के फार् म पर हस् ताक् षर कए हि ै ं ।

हसताकषर नाम: डॉ पावनी बोददपलली

पदनाम: पीजी

शलय चकित्सि ा वभिाग

सं पर् क नं बर- 9677252125

SANTOSH MEDICAL COLLEGE & HOSPITAL

Details of Patient Information Sheet
Human Subject Research Proposal

1) Identifying Data
Name of Researcher: Dr. Pavani boddupalli
Department: Department of General Surgery
Title of Project**: Diffrent modalities of management of liver abscess.**

2) Description of Human Subjects Safeguards and Rights:
A) Possible psychological or physical risk or discomfort, involved in research
Yes NO (if no, skip item B)
If Yes, answer the following
Why necessary?
1. To have the common disease
2. Specificity and sensitivity of the treatment

B) Make sure the following questions are answered in your research proposal on collection of Data:
1) When will it take place?
December 2022- December 2023
2) What length of time needed for complete examination of the patient?
Approx 1 hour.
3) What period of time needed?
Approx 1 year.
4) Which specific place within institution?
Department of Surgery.
5) How much population required including number of subjects?
6) Name of instrument to be used for data collection?
USG findings (Post Voidal Residue, Prostate size)
Uroflowmetry findings and graphs
international prostate symptom scoring
7) Methodology to be used (write details)?
A detailed history of all patients will be taken and a thorough clinical examination will be done. All patients will be analyzed in various aspects like USG findings (Post Voidal Residue, Prostate size), Uroflowmetry findings and graphs and international prostate symptom scoring

- The analyzed data will be correlated with other series in literature and discussed. A master chart dealing with all aspects will be designed and presented. A proforma will be used for the study purpose.

C) Will Subjects be given research results if they so request?
Yes No

ETHICAL CLEARANCE

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/R/2023/2489[43] Dated: 26.09.2023

Subject: Grant of Ethical Clearance for **Thesis Protocol** Topic **"DIFFERENT MODALITIES OF MANAGEMENT OF LIVER ABSCESS",** submitted by **Dr. BODDUPALLI PAVANI,** MD/MS student of Batch 2022-2023, Department of **GENERAL SURGERY**.

*****

With reference to his/her request for grant of Ethical Clearance for the Thesis Protocol entitled **"DIFFERENT MODALITIES OF MANAGEMENT OF LIVER ABSCESS", Dr. BODDUPALLI PAVANI** is informed that the **Thesis Protocol** submitted by him/her was considered by the **Screening Committee** of the Santosh Medical College & Hospital in its meetings held on 17.07.2023 to 28.07.2023. The recommendations of the **Screening Committee** were considered in detail by the **Institutional Ethics Committee** in its meeting held on **23.09.2023** and the same was **approved** by the **Ethics Committee.**

He /She is informed accordingly for further necessary action.

[Dr. NARESH SHARMA]
REGISTRAR

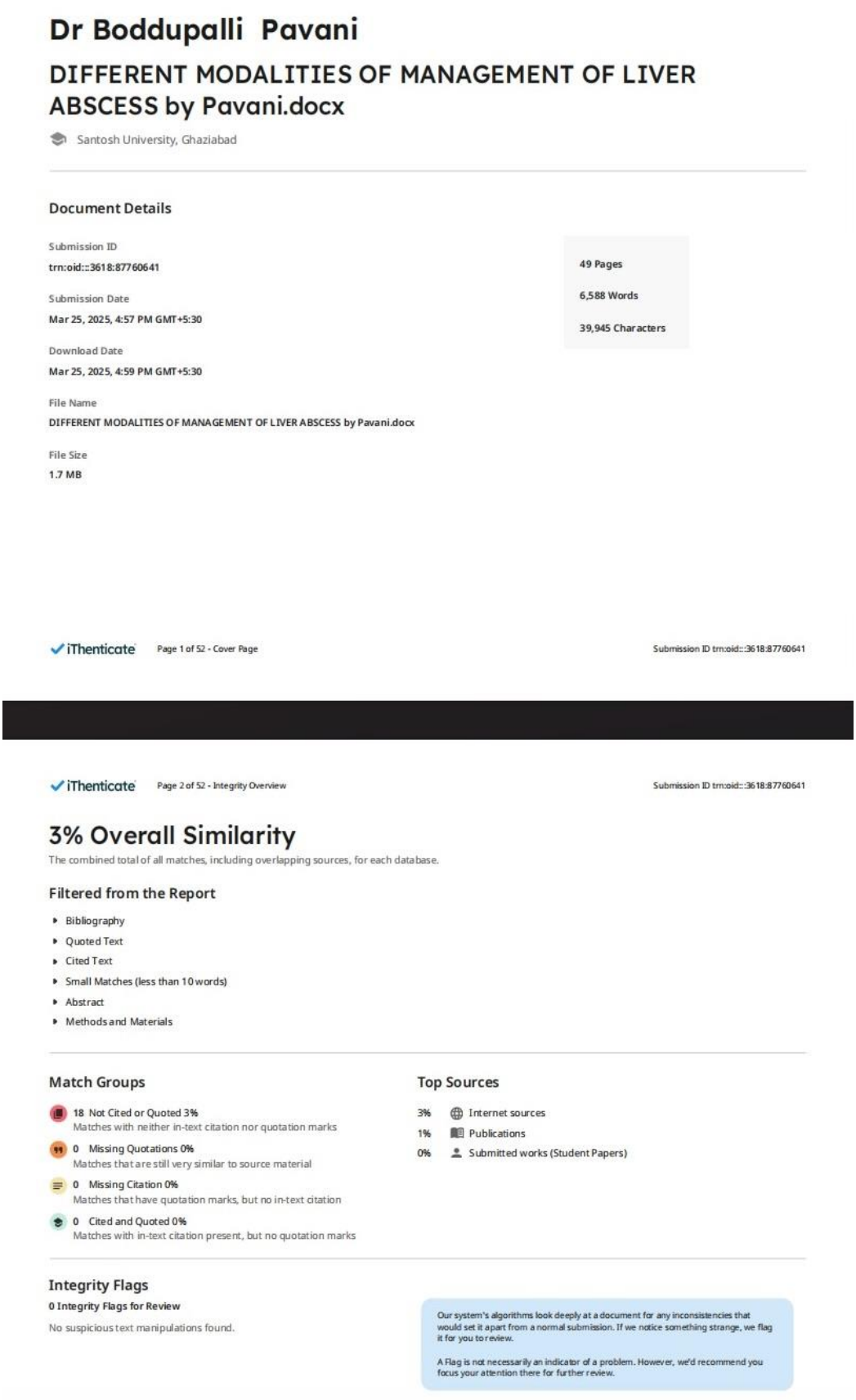
SANTOSH DEEMED TO BE UNIVERSITY REGISTRAR GHAZIABAD, NCR DELHI

Dr. BODDUPALLI PAVANI
MD/MS student of batch 2022-2023
Department of GENERAL SURGERY
Email: pavaniboddupalli15@gmail.com

Copy to:

1. The Vice Chancellor
2. The Dean, SMC&H
3. The Dean – Academics
4. The Dean – Research
5. The Director - IQAC
6. Dr. Sameer Hassan Naqash (Guide)
7. HOD of GENERAL SURGERY

PLAGIARISM CERTIFICATE



Dr Boddupalli Pavani

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MASTER CHART

UHID	Age	Gender	Abdominal Pain	Vomiting	Fever	Diarrhoea	Jaundice	Others complaints	Co-morbidities	alcoholic	HR	RR	SBP	DBP	SpO2	Temperature	Per Abdomen	Total Leukocyte count (TLC)	Bilirubin	INR	Albumin	Abscess Size (ml)	Site	Number of cavity	Septations	Ruptured	Medical management	USG Guided Needle aspiration	USG Guided pigtail catheterization	Laparoscopic Drainage	Open Drainage	Modalites of treatment	Liquified abscess
17556918	**28yrs**	Male	Yes	Yes	Yes	No	No	No	None	Yes	78	22	114	79	96	99.2°F	Tenderness, Guarding	29567	0.2	1.62	2.4	267	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17289791	**29yrs**	Male	Yes	Yes	Yes	No	No	None	None	Yes	112	20	102	75	94	99.4°F	Tenderness	22345	0.5	1.44	4	458	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17300211	**20yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	114	27	94	56	95	99.8°F	Tenderness, Guarding, Rigidity, Reduced bowel sounds	13897	0.9	1.57	2.9	1098	Right Lobe	Single	No	Yes	No	No	No	No	Yes	Open drainage	**Partial**
17258629	**55yrs**	Male	Yes	No	Yes	Yes	No	None	Diabetes	Yes	89	22	116	78	96	99.8°F	Tenderness	12367	0.4	1.1	4.6	115	Right Lobe	Single	No	No	No	Yes	No	No	No	USG Guided aspiration	**Yes**
17260171	**45yrs**	Male	Yes	Yes	Yes	Yes	No	None	Diabetes	Yes	124	28	86	66	92	100.3°F	Tenderness, Distension	24587	0.6	1.45	2.8	657	Right Lobe	Multiple	Yes	No	No	No	No	Yes	No	Laparoscopic drainage	**Partial**
17265345	**16yrs**	Male	Yes	No	Yes	No	No	None	None	No	86	22	101	79	98	102.7°F	Tenderness, Distension, Guarding, Rigidity	23498	0.8	0.72	5	456	Right Lobe	Multiple	No	Yes	No	No	No	No	No	Yes	Open drainage	**Partial**
17266065	**35yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	76	18	119	75	98	101.4°F	Tenderness	12765	1.2	0.65	3.6	83	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
1726801	**20yrs**	Male	Yes	No	Yes	No	No	None	None	No	75	17	113	71	97	97.5°F	Tenderness	12487	1.1	0.87	3.7	76	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17266317	**48yrs**	Male	Yes	Yes	Yes	No	No	None	Diabetes	Yes	78	17	114	78	99	98.3°F	Tenderness	15679	0.1	0.63	4.2	349	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17253018	**63yrs**	Female	Yes	Yes	Yes	Yes	No	Generalised body weakness	Diabetes	No	114	19	88	62	96	99.8°F	Tenderness, Guarding	22498	0.4	0.92	4.7	398	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17258134	**70yrs**	Male	Yes	No	Yes	No	No	Loss of appetite	Hypertension	Yes	76	18	124	89	100	101.5°F	Tenderness	13098	0.3	0.9	4.9	298	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17267548	**74yrs**	Male	Yes	Yes	Yes	Yes	No	obstipation	Diabetes	Yes	112	29	84	<70	88	100.1°F	Distension, Guarding, Rigidity, Reduced bowel sounds	24980	0.9	0.69	2.1	674	Right Lobe	Multiple	Yes	Yes	No	No	No	No	Yes	Open drainage	**Yes**
17267531	**30yrs**	Male	Yes	No	Yes	No	No	None	Hypertension	No	92	26	146	100	98	102.6°F	Tenderness	18976	0.5	1.1	3.8	118	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17267561	**63yrs**	Male	Yes	No	Yes	No	No	None	Hypertension	Yes	89	22	148	102	97	99.8°F	Tenderness	18790	0.6	1.12	3.9	279	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17259210	**51yrs**	Female	Yes	No	Yes	no	No	Generalized weakness	Hypertension	No	113	28	98	62	99	101.2°F	Tenderness, Guarding	23908	0.7	1.26	3.9	319	Left Lobe	Single	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17273825	**62yrs**	Male	Yes	No	Yes	No	No	Shortness of breath	Diabetes	Yes	87	22	101	86	96	101.2°F	Tenderness	12980	0.6	1.33	4.5	53	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17278269	**36yrs**	Female	Yes	No	Yes	No	No	None	Diabetes	Yes	79	22	119	88	99	101.5°F	Tenderness	15678	1.1	0.78	4.9	228	Left Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17251450	**60yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	None	Yes	77	28	88	60	86	102.1°F	Distension, Guarding, Rigidity, Reduced bowel sounds	25987	1.2	1.67	2.9	772	Both	Multiple	No	Yes	No	No	No	No	Yes	Open drainage	**Yes**
17258348	**58yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	79	19	106	88	98	99.8°F	Tenderness	30789	1	0.93	4.2	229	Both	Multiple	No	No	Yes	No	No	No	No	Medical Management	**No**
17258143	**35yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	None	Yes	118	19	89	66	97	103.4°F	Distension, Guarding	26709	0.5	1.66	4.7	456	Left Lobe	Single	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17299643	**31yrs**	Male	Yes	Yes	Yes	Yes	No	Generalized weakness	None	No	119	21	96	58	99	101.4°F	Distension, Guarding	22908	0.7	0.91	4.9	789	Right Lobe	Single	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17264292	**40yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	None	Yes	124	21	88	59	96	103.2°F	Distension, Guarding, Rigidity	24567	0.6	0.9	2.1	526	Right Lobe	Multiple	No	Yes	No	No	No	Yes	Yes	Laparoscopic drainage, Open drainage	**Yes**
17330204	**45yrs**	Male	Yes	Yes	Yes	No	No	Generalized weakness	Diabetes	Yes	135	26	86	59	98	99.8°F	Tenderness, Distension, Guarding, Reduced bowel sounds	22908	0.6	1.88	3.2	1128	Both	Multiple	No	No	No	No	No	No	Yes	Open drainage	**Yes**
17330459	**50yrs**	Male	Yes	Yes	Yes	No	No	Abdominal distension	None	Yes	117	22	92	62	95	104°F	Distension, Guarding, Rigidity, Exaggrated bowel sounds	44587	0.8	1.66	3.1	1093	Right Lobe	Single	Yes	Yes	No	No	No	No	Yes	Open drainage	**Yes**
17550192	**38yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	79	22	101	88	98	100.1°F	Tenderness, Lump	17897	1.2	0.9	3.8	987	Right Lobe	Single	Yes	No	No	No	No	No	Yes	Open drainage	**Partial**
17471355	**32yrs**	Female	Yes	Yes	Yes	No	No	None	Diabetes	No	76	21	119	86	97	101.4°F	Tenderness, Lump	17893	1.1	1.1	3.9	1076	Right Lobe	Single	No	No	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17250269	**28yrs**	Male	Yes	Yes	Yes	No	No	Abdominal distension	None	Yes	118	26	92	61	91	101.4°F	Distension, Lump, Guarding, Rigidity, Reduced bowel sounds	38907	0.1	1.12	3.9	887	Right Lobe	Single	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17270838	**8yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	No	76	21	112	88	98	103.2°F	Tenderness, Lump	17894	0.4	1.2	4.5	445	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17335342	**49Yrs**	Male	Yes	No	Yes	No	No	None	Thyroid Disorder	No	86	22	104	86	97	100.2°F	Tenderness	16987	0.3	1.23	4.9	112	Left Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17311753	**58yrs**	Female	Yes	Yes	Yes	No	No	None	Thyroid Disorder	No	112	22	115	89	99	101.4°F	Tenderness, Lump	22897	0.9	1.34	3.7	984	Left Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17330003	**40yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	Diabetes	Yes	90	18	88	62	89	98.1°F	Distension, Lump, Guarding, Rigidity, Exaggrated bowel sounds	34879	0.5	1.13	2.6	1045	Both	Multiple	Yes	Yes	No	No	No	No	Yes	Open drainage	**Partial**
17252901	**29yrs**	Male	Yes	No	No	No	No	None	None	No	89	18	112	74	96	98.3°F	Tenderness	14980	0.6	1.12	5	64	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17260726	**25yrs**	Male	Yes	No	No	No	No	None	None	No	91	17	104	77	98	97.8°F	Tenderness	7892	0.7	0.8	5	62	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17335341	**62yrs**	Male	Yes	Yes	Yes	No	No	None	None	Yes	94	19	115	72	97	101.4°F	Tenderness, Lump	22897	0.6	0.89	3.9	709	Left Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17471358	**28yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	None	Yes	118	28	97	66	88	103.2°F	Distension, Guarding, Rigidity, Exaggrated bowel sounds	42908	1.1	1.62	2.9	718	Right Lobe	Single	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17260752	**36yrs**	Male	No	No	No	No	No	Abdominal distension	None	Yes	78	21	119	74	98	98.6°F	Distension	8945	1.2	0.92	3.9	198	Right Lobe	Single	No	No	No	Yes	No	No	No	USG Guided aspiration	**Yes**
17260752	**27yrs**	Male	Yes	No	No	No	No	None	None	No	78	22	113	77	97	98.3°F	Tenderness	6789	0.2	0.67	3.9	45	Left Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17247757	**29yrs**	Male	No	No	Yes	No	No	None	None	Yes	76	22	114	72	99	100.1°F	Tenderness	23478	0.5	0.9	3.8	682	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17388094	**70yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	75	21	106	79	97	101.3°F	Tenderness	12908	0.9	1.1	4.2	435	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17273001	**29yrs**	Male	Yes	Yes	Yes	Yes	No	Abdominal distension	None	Yes	122	26	88	61	91	100.9°F	Distension, Guarding, Rigidity	27890	0.4	1.64	5	867	Right Lobe	Single	Yes	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17357844	**20yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	Yes	113	28	97	56	88	101.8°F	Tenderness, Distension, Reduced bowel sounds	42908	0.6	0.9	4.1	654	Right Lobe	Multiple	No	Yes	No	No	No	Yes	No	Laparoscopic drainage	**Yes**
17471354	**25yrs**	Male	No	No	No	No	No	Abdominal bloating	None	Yes	96	21	114	74	98	97.8°F	Distension	7564	0.8	1.1	4.6	78	Right Lobe	Single	No	No	Yes	No	No	No	No	Medical Management	**No**
17258104	**28yrs**	Male	Yes	No	No	Yes	No	None	None	No	87	22	102	77	97	97.5°F	Tenderness	12897	0.2	1.12	3.8	432	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17317088	**26yrs**	Male	Yes	No	Yes	No	No	None	None	Yes	76	23	118	72	99	101.8°F	Tenderness	24587	0.5	1.2	3.9	112	Right Lobe	Single	No	No	No	Yes	No	No	No	USG Guided aspiration	**Yes**
17322830	**65yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	No	78	24	106	79	96	101.3°F	Tenderness, Distension	27896	0.9	1.23	3.8	435	Right Lobe		No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17324134	**38yrs**	Male	Yes	No	No	No	Yes	None	None	Yes	82	21	111	75	96	97.5°F	Tenderness, Distension	26687	0.4	1.77	3.6	763	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17327437	**44yrs**	Male	No	No	No	No	Yes	Abdominal distension	None	No	86	24	120	71	95	98.6°F	Tenderness	17698	0.6	1.12	4.1	145	Right Lobe	Single	No	No	No	Yes	No	No	No	USG Guided aspiration	**Yes**
17534889	**20yrs**	Male	No	No	No	Yes	No	Abdominal distension	None	Yes	87	21	105	78	98	97.9°F	Distension	12987	0.8	1.2	4.5	438	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17480257	**70yrs**	Male	Yes		Yes	Yes	No	None	Diabetes	No	78	23	108	73	97	100.9°F	Tenderness, Distension	21967	1.2	1.67	4.6	674	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17537121	**31yrs**	Female	Yes	No	Yes	Yes	No	None	None	No	76	21	113	80	96	101.8°F	Tenderness, Distension	17659	1.1	1.72	4.3	365	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17520518	**50yrs**	Female	Yes	Yes	Yes	Yes	No	None	Diabetes	Yes	112	22	119	76	98	103.5°F	Tenderness, Distension	29087	0.1	1.44	4.7	689	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17408074	**59yrs**	Female	Yes	No	No	Yes	Yes	None	Thyroid Disorder	No	113	23	109	74	97	98.1°F	Tenderness, Distension, Lump	20987	0.4	1.56	2.6	782	Left Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17466233	**57yrs**	Female	Yes	Yes	Yes	Yes	No	None	Diabetes	No	144	21	116	77	99	100.2°F	Tenderness	15987	0.3	0.9	3.9	498	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17524312	**18yrs**	Male	Yes	No	No	No	No	None	None	No	89	24	103	72	96	98.3°F	Tenderness	15001	0.9	1.66	3.8	327	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17327499	**34yrs**	Male	Yes	No	Yes	Yes	No	None	None	Yes	98	20	120	79	98	101.4°F	Tenderness	25679	0.8	1.56	4.2	587	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17443344	**38yrs**	Female	Yes	Yes	Yes	Yes	No	None	None	No	112	22	107	75	95	103.2°F	Tenderness	45964	0.3	0.91	5	321	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17443344	**20yrs**	Male	Yes	No	No	Yes	Yes	None	None	No	113	19	112	71	98	97.5°F	Tenderness, Distension	18763	1.9	1.64	4.1	543	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17533184	**45yrs**	Male	Yes	Yes	Yes	Yes	No	None	Hypertension	No	119	24	104	78	97	100.2°F	Tenderness	23098	0.9	0.91	4.6	412	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17533499	**48yrs**	Male	Yes	No	Yes	Yes	No	None	Diabetes	Yes	109	22	115	73	98	101.2°F	Tenderness	17983	0.4	1.72	2.6	213	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17375622	**30yrs**	Male	Yes	No	Yes	No	No	None	Thyroid Disorder	No	106	21	110	80	97	99.8°F	Tenderness	18769	0.6	0.72	4.1	314	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17453350	**17yrs**	Female	Yes	No	Yes	No	No	None	None	No	96	20	117	76	99	100.2°F	Tenderness	24875	0.8	0.65	4.6	564	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17454603	**47yrs**	Female	Yes	Yes	Yes	Yes	No	None	Diabetes	No	64	21	101	74	96	102.6°F	Tenderness, Lump	22965	1.2	0.87	3.8	349	Left Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17456809	**47yrs**	Male	Yes	Yes	Yes	Yes	No	None	Diabetes	No	67	24	119	77	94	99.8°F	Tenderness	17927	1.1	0.63	3.9	368	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17457793	**25yrs**	Male	Yes	Yes	Yes	No	No	None	None	No	68	23	113	72	95	99.8°F	Tenderness	22098	0.1	0.92	3.8	392	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17458222	**25yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	No	113	20	114	79	98	100.3°F	Tenderness	18796	0.4	0.9	3.6	549	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17509612	**41yrs**	Male	Yes	Yes	Yes	No	No	None	None	No	89	19	106	75	97	100.3°F	Tenderness	29810	0.3	0.69	4.1	562	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17511955	**35yrs**	Female	Yes	Yes	Yes	Yes	No	None	None	No	112	22	114	71	100	102.7°F	Tenderness	17928	0.9	1.1	4.5	392	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17513160	**55yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	Yes	112	20	102	78	98	99.4°F	Tenderness	22409	0.5	1.12	4.6	581	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17387786	**42yrs**	Male	Yes	No	Yes	No	No	None	Diabetes	No	118	24	118	73	97	99.4°F	Tenderness	19870	0.6	1.26	4.3	329	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17484646	**47yrs**	Male	Yes	No	Yes	Yes	No	None	None	Yes	109	21	106	80	99	99.8°F	Tenderness	18709	0.7	1.33	4.7	498	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17517164	**26yrs**	Male	Yes	Yes	Yes	Yes	No	None	None	No	108	19	111	74	96	100.1°F	Tenderness	26987	0.6	0.78	4.1	429	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17518655	**33yrs**	Female	Yes	No	No	No	No	None	None	Yes	119	18	120	77	99	97.6°F	Tenderness	22890	1.1	1.67	4.6	318	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**
17519993	**24yrs**	Male	Yes	Yes	No	No	No	None	None	No	113	22	105	72	95	98°F	Tenderness	18970	1.2	0.93	3.8	539	Right Lobe	Single	No	No	No	No	Yes	No	No	USG Guided pigtail catheterization	**Yes**